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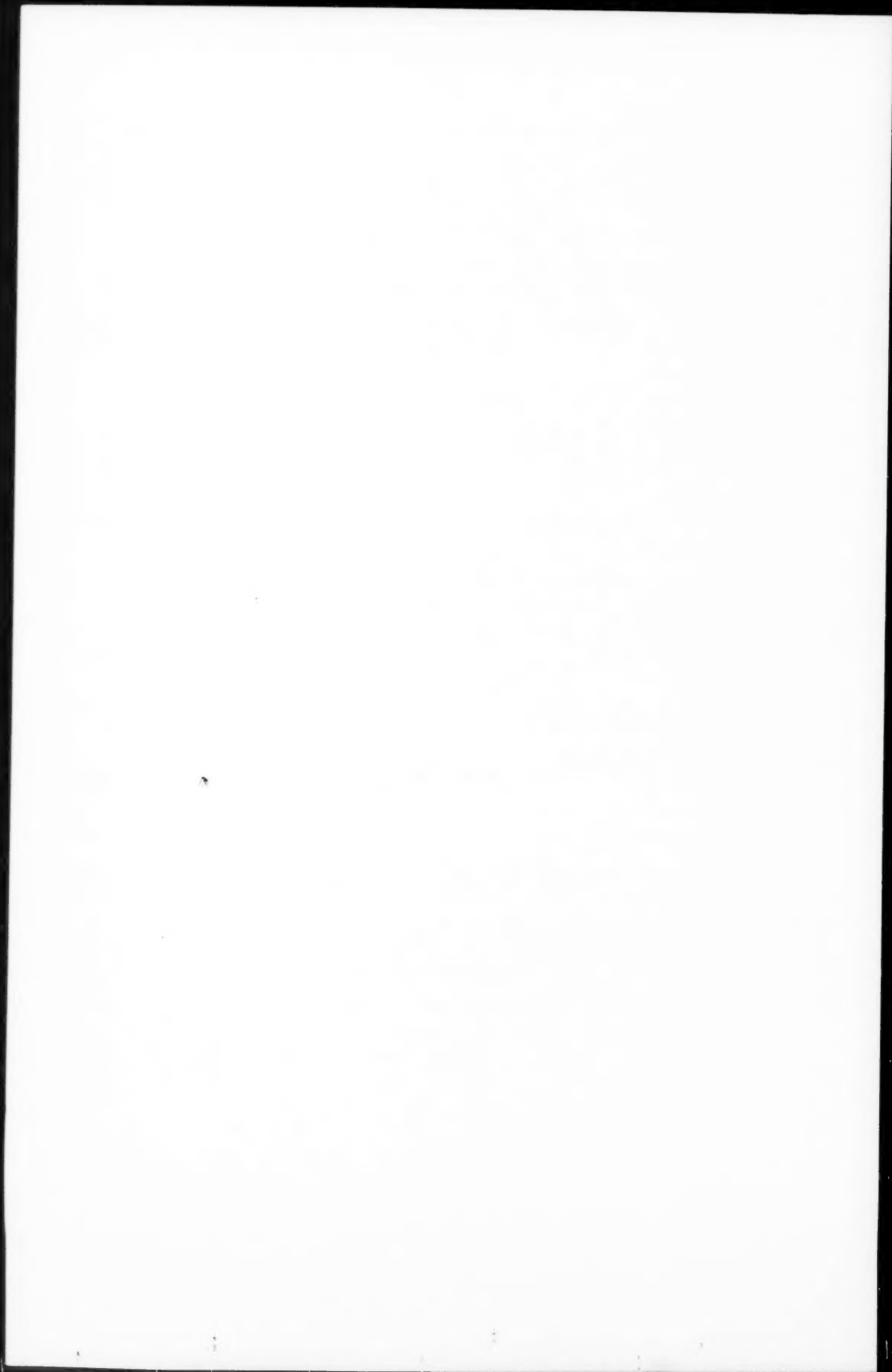
IN THIS ISSUE

ADEQUATE diets and improved nutritional status of industrial workers have been shown to be effective measures for increasing work efficiency and promoting better health. Results of a survey of 610 male industrial workers in New Jersey reported by M. J. Babcock, Helen N. Church, and Lorraine O. Gates in the article entitled "Nutritional Status of Industrial Workers" indicate that 26 per cent of the men gave evidence of suboptimal nutrition in one or more vitamins. Diet histories, blood values, and physical signs were used to evaluate nutritional status. Evidence of a deficiency of calcium, riboflavin, or ascorbic acid was found most frequently. When all the data for each subject was reviewed, half of the men were advised to increase their consumption of fruits and vegetables and dairy products. Obesity also was observed frequently and one-fourth of the men were advised to reduce consumption of sugars and starches.

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The Department of Biostatistics of the School of Hygiene and Public Health of the Johns Hopkins University has made a series of censuses of the population in the Eastern Health District of Baltimore, Maryland. A census was made in 1922, 1933, 1936, 1939, and one in 1947. From the information which was obtained concerning persons and their families living in this district has come a valuable collection of research papers under the general heading of "Family Studies In The Eastern Health District."

The paper "Family Structure And Its Changing Pattern" by Dr. Matthew Taback deals with material obtained in the Eastern Health District studies. Identification of families from one census to another offers an excellent opportunity to study

the family's change in structure over a period of years. The type of material which is presented by Dr. Taback is not easily available and is therefore unique.

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Now that the original analysis of the Indianapolis Study results is nearing completion, there has been an active interest expressed in unifying the various findings into a single integrated work. In addition, many new statistical techniques have developed since the Study was initiated and an interest in their applicability to the Indianapolis Study data has also increased. The article "The Prediction of Total Fertility" by Edgar F. Borgatta and Charles F. Westoff represents one attempt to integrate the data on fertility planning and total fertility with the use of the comparatively new technique of scale analysis, in conjunction with factor analysis.

NUTRITIONAL STATUS OF INDUSTRIAL WORKERS[1, 2]

I. DIETARY, BLOOD, AND PHYSICAL FINDINGS

M. J. BABCOCK, HELEN N. CHURCH, AND LORRAINE O. GATES

INTRODUCTION

FEW comprehensive studies have been made of the nutritional status of industrial workers, although it is generally recognized that adequate nutrition of workers is necessary for high production levels (National Research Council, 1945; *Nutrition Reviews*, 1953). Prior to the enrichment program, Borsook and co-workers studied the nutritional status of a large group of air-craft workers in southern California (Wiehl, 1942; Borsook, *et al*, 1943; Borsook, 1945; Borsook, *et al*, 1946; Borsook and Wiehl, 1946). They used dietary records, physical examinations, blood tests, and vitamin supplementation to evaluate nutritional status. In another study reported in 1942, Schnedorf, *et al*, used dietary ratings, physical examinations, and blood tests in a vitamin survey of industrial workmen. More recently, Trulson, *et al*, (1949) have reported the food intakes of low income male and female industrial workers.

Data for the study reported here were gathered from 610 male industrial workers employed in four chemical and pharmaceutical plants in central New Jersey during the period December, 1948, to November, 1950, inclusive. No data were collected during the summer months. The subjects were men who reported for routine physical examinations and who consented to participate in this study. As most of the men gave their consent, the sample studied is considered to be essentially a random sample representative of the male employees of these companies. The study included (1) a record of the usual food

intake, obtained by a thirty-minute interview with each sub-
ject, (2) a seven-day food consumption record kept by each
subject (318 subjects only), (3) analysis of the blood for hemo-
globin and serum for carotene, vitamin A, and ascorbic acid,
and (4) a special physical inspection by a physician for signs
of nutritional deficiencies. The methods used have been de-
scribed elsewhere (Northeast Region, 1951).

Because this research was part of the NE-4 cooperative re-
gional study on nutritional status, much of the data on phys-
ical signs, dietary findings, and blood findings have been com-
pared to similar data from other population groups in a series
of regional bulletins (Babcock, *et al*, 1952; Tucker, *et al*, 1952;
Clayton, *et al*, 1953; Babcock, *et al*, 1953). In this paper the
various types of data pertaining to industrial workers have
been brought together, additional data have been integrated,
the data have been tabulated in a different manner, and the
findings have been interpreted from the viewpoint of industrial
nutrition.

Tabulation of Data

To summarize the data, it was necessary to classify them
into arbitrarily defined groups. The classifications used in this
paper were made as follows:

Weight Rating. Although the height-weight relationship is
not the best criterion for overweight and underweight, it was
applied here as a rough measure because of its simplicity.
Weights within 10 pounds of those given in the Medico-Ac-
tuarial Investigations of 1912 (Davenport, 1923) were rated
as normal.

General Appearance. Rated by the physician as good, fair,
or poor physical appearance.

Work. Rated by the interviewer as sedentary, physically
active, or very active.

Income Level. Since the income available for the purchase
of food is dependent on the total income of the household and
the number of persons in the household, the income rating was
determined by dividing the weekly household income, in dol-

lars, by the total of adult units. The values for adult units were approximated from the values given by Stiebeling and Clark (1939) for food-expenditure units as follows:

Adult Units

Man

	Very Active	1.1
	Physically Active	1.0
	Sedentary	0.9
Woman		0.9
Child		0.7

Educational Level. Grade in school, or its equivalent as other formal education.

Religion. Classified as Catholic, Jewish, or Protestant because some of the data were collected during fasting periods.

Ethnic Group. Dietary patterns were dominantly American, but in many cases they were influenced by the race or nationality of one or more members of the household. Such influence was tabulated according to the ethnic groups listed in Table 3.

Dietary Ratings. Quantities of nutrients, calculated from each dietary history and record, equal to or greater than the National Research Council Recommended Dietary Allowances (1948) for a physically active man, were rated as "high." As the Recommended Dietary Allowances do not have any fixed relationship to the minimum requirement, values more closely approximating the theoretical minimum requirements were chosen as a dividing line between the "moderate" and the "low" ratings. The values, based on the discussion accompanying the 1948 revision of the Recommended Dietary Allowances, which were arbitrarily selected to define the lower limits of the "moderate" group are shown in Table 1.

In the results presented in this paper, no attempt was made to adjust the dietary ratings for differences in the subject's activity because it was questionable whether activity should be based on the interviewer's estimate, the caloric intake calculated from the interview data, or the caloric intake calculated from the seven-day food record.

Nutrient	High	Moderate	Low
Protein, Grams	70 and Over	40 to 70	Less Than 40
Calcium, Grams	1.0 and Over	0.7 to 1.0	Less Than 0.7
Phosphorus, Grams	1.5 and Over	1.0 to 1.5	Less Than 1.0
Iron, Mg.	12 and Over	8 to 12	Less Than 8
Vitamin A, I.U.	5,000 and Over	3,000 to 5,000	Less Than 3,000
Thiamine, Mg.	1.5 and Over	0.7 to 1.5	Less Than 0.7
Riboflavin, Mg.	1.8 and Over	1.0 to 1.8	Less Than 1.0
Niacin, Mg.	15 and Over	7.5 to 15	Less Than 7.5
Ascorbic Acid, Mg.	75 and Over	25 to 75	Less Than 25

Table 1.   Levels of various nutrients used for rating dietary histories and records.

Vitamin Supplements. Nutrients taken in tablet form were not included in the calculation of dietary data, but they were tabulated separately. A subject was listed as receiving a vitamin supplement if the quantity consumed provided a daily average of more than 20 per cent of the Recommended Daily Allowance for any of the five vitamins included in this study.

Blood Chemistry Ratings. The following ratings, based on those given by Bessey and Lowry (1947), were used:

	High	*Moderate*	*Low*
Vitamin A (micrograms per 100 ml. serum)	30 and Over	20 to 30	Less than 20
Carotene (micrograms per 100 ml. serum)	120 and Over	80 to 120	Less than 80
Ascorbic acid (mgm. per 100 ml. serum)	0.7 and Over	0.4 to 0.7	Less than 0.4
Hemoglobin (grams per 100 ml.)	14 and Over	12 to 14	Less than 12

Physical Inspection Ratings. The physical inspections were based on a modification of the form published by Sandstead and Anderson (Northeast Region, 1951). The terms used are given in Table 7. To simplify the table, signs rated only as "absent" or "present" have been included in the columns headed "normal" and "moderate," respectively.

Composite Physical Rating. The analysis of the physical data was complicated by the large number of individual signs recorded. As a preliminary method of screening the data, it was decided to combine the physical ratings into a composite

rating for each of the five vitamins studied. Since there was no way of determining the relative importance of each sign, the simple expedient of adding the individual ratings was adopted. The clinical signs suggestive of each vitamin deficiency were based on the list by Jolliffe and Alpert (1947), and they were scored 0 if normal or absent, 1 if mild, 2 if moderate or "present," and 3 if severe. If the total score for a vitamin were 0 or 1, a composite physical rating of "high" was assigned, if 2 or 3, "moderate," and if 4 or more, "low." The list of clinical signs and possible scores for each are given below:

		Possible Score
Vitamin A:		
	Blepharitis	0, 1, 2, or 3
	Palpebral conjunctiva, inflammation	0, 1, 2, or 3
	Bulbar conjunctiva, thickening	0, 1, 2, or 3
	Acne	0, 1, 2, or 3
	Xerosis	0, 1, 2, or 3
	Folliculosis	0, 1, 2, or 3
Thiamine:		
	Neurological Findings—	
	Subnormal knee jerk response	0 or 2
	Subnormal ankle jerk response	0 or 2
	Subnormal vibratory sense	0 or 2
	Calf tenderness	0 or 2
Riboflavin:		
	Blepharitis	0, 1, 2, or 3
	Bulbar conjunctiva, increased vascularity	0, 1, 2, or 3
	Outer canthi, lesions	0, 1, 2, or 3
	Nasolabial seborrhea	0, 1, 2, or 3
	Acne	0, 1, 2, or 3
	Cheilosis	0, 1, 2, or 3
	Tongue, magenta	0 or 2
	Tongue, changes in papillae	0, 1, 2, or 3
Niacin:		
	Palpebral conjunctiva, inflammation	0, 1, 2, or 3
	Stomatitis (buccal mucosa)	0, 1, 2, or 3
	Tongue, red	0 or 2
	Tongue changes in papillae	0, 1, 2, or 3
	Tongue, swelling	0 or 2
	Dermatitis	0 or 2
Ascorbic acid:		
	Gingivitis	0, 1, 2, or 3
	Perifollicular petechiae	0 or 2
	Purpura	0 or 2

Over-All Vitamin Rating. Metcoff, *et al* (1945), have emphasized that no one symptom, sign, or laboratory finding is

pathognomonic for a nutritional deficiency and the various kinds of data suggestive of inadequate nutrition must be interpreted together and evaluated as a whole *for each individual.* While this point is widely recognized, there is no generally accepted scheme for integrating such diverse data. Metcoff, *et al,* used a purely arbitrary procedure suitable to their data. We, likewise, have set up an arbitrary method of rating adapted to the types of data collected in our study. It is recognized that, as with our composite physical rating, there is no sound basis for evaluating the relative importance of each component of the rating. Each subject's dietary, blood, and composite physical ratings for a vitamin were, therefore, weighted equally by assigning numerical values ("high" = 3, "moderate" = 2, and "low" = 1) to each and averaging the numerical values. An average of 2.0, or lower, was arbitrarily used to classify the subject as having suboptimal nutritional status with respect to that vitamin. The only dietary ratings used in this procedure were those derived from the dietary history interviews because seven-day food consumption records were available for only about one-half of the subjects. The only blood ratings used were those for serum vitamin A and ascorbic acid because the other constituents determined, hemoglobin and serum carotene, are only indirect measures of vitamin status.

RESULTS

Characteristics of the Sample. The sample studied has been

Table 2.   Distribution of subjects studied by age, activity and religion.

AGE OF SUBJECTS		WORK RATING		RELIGION	
Years	Per Cent of Total	Activity	Per Cent of Total		Per Cent of Total
TOTAL (606)	100	Total (610)	100	Total (543)	100
20–29	27	Very Active	35	Catholic	46
30–39	45	Physically Active	48	Protestant	52
40–49	17	Sedentary	17	Jewish	1
50–59	7				
60–69	3				

described briefly in the introduction. The data in Tables 2 and 3 show that this sample contained a large proportion of men from 20 to 40 years of age, mostly engaged in moderate to very active work. The incomes and educational levels of these men covered a wide range. Their religious affiliation was approximately equally divided between Catholic and Protestant. The food habits of one-third of the men were probably influenced by a Slavic background, and smaller fractions by Negro, Italian, and German customs.

Dietary Findings. Quantitative estimates of usual food consumption were obtained by a trained nutritionist in a thirty-minute interview with each subject. Typical empty dishes, spoons and, when necessary, photographic and wooden food models were used to help the men judge serving sizes. In addition, each worker was instructed to keep a quantitative record of his actual food consumption during the next seven days. Fifty-two per cent (318 subjects) completed their seven-day records.

Caloric intakes calculated from the dietary interview data averaged 2,988 for the sedentary group, 2,915 for the phys-

Table 3. Distribution of subjects studied by income, education and ethnic group.

WEEKLY INCOME		EDUCATIONAL LEVEL		ETHNIC GROUP	
Dollars Per Adult Unit	Per Cent of Total	Grade Completed or College Years	Per Cent of Total	Group	Per Cent of Total
TOTAL (533)	100	Total (605)	100	Total (588)	100
5–9	2	Less Than 8	16	American	39
10–14	13	8	16	English	3
15–19	26	9 or 10	18	German	5
20–24	19	11	6	Italian	9
25–29	14	12	26	Scandinavian	1
30–34	10	College-1	5	Slavic	32
35–39	4	2	4	Negro	9
40–44	2	3	1	Miscellaneous	1
45–54	5	4	7		
55–64	5	M.S.	1		

ically-active group, 3,259 for the very active group, and 3,053 for all groups (606 subjects). Corresponding values from the seven-day food records were 2,709, 2,739, 2,785, and 2,746 calories for the entire group (318 subjects).

The tendency for higher intakes to be recorded in dietary history interviews, as compared with those in the seven-day food consumption records kept by the subjects, may have been caused by several factors. They include:

     1. Differences in the samples studied.
     2. Over-estimation in the interviews.
     3. Under-estimation in the seven-day records.

Differences in the overlapping samples of men who supplied the history and seven-day record data were noted in their educational levels, incomes, and dietary histories. The men who kept dietary records for seven days had, on the average, a higher educational level (eight months more schooling), a slightly higher income level (an average of $1.80 more family income per week), and slightly lower dietary history values than the larger group of men who supplied the dietary history

Table 4. Comparison of dietary histories and seven-day dietary records of 318 men.

	MEAN HISTORY	MEAN RECORD	MEAN DIFFERENCE	STANDARD ERROR OF DIFFERENCE	PER CENT DIFFERENCE
Calories	2,909.	2,745.	+164.**	38.7	5.98
Protein, Gm.	93.5	90.0	+3.5**	1.33	3.84
Calcium, Gm.	1.130	.934	+.196**	.0240	20.97
Phosphorus, Gm.	1.731	1.559	+.172**	.0256	11.02
Iron, Mg.	16.96	16.12	+.84**	.266	5.20
Vitamin A, I. U.	10,470.	8,240.	+2,230.**	303.	27.04
Thiamine, Mg.	1.600	1.545	+.055*	.0258	3.57
Riboflavin, Mg.	2.317	2.005	+.312**	.0397	15.58
Niacin, Mg.	20.2	19.6	+.6*	.32	3.32
Ascorbic Acid, Mg.	102.6	77.1	+25.5**	2.48	33.22

** Difference significant at the 1 per cent level.
* Difference significant at the 5 per cent level.

data. The last comparison is based on means given in Table 4 and means previously published (Tucker, et al, 1952).

To determine whether other factors than sample differences were involved, a further study was made in which sample differences were eliminated by restricting the analysis to those subjects who supplied both types of dietary information. Although significant differences were still found between the means obtained by the dietary history and the seven-day record for all nutrients, the percentage differences were small (3 per cent to 6 per cent) for calories, protein, iron, thiamine, and niacin (Table 2). The larger percentage differences obtained for calcium, phosphorus, vitamin A, riboflavin, and ascorbic acid show that other factors, such as estimation errors, must also have contributed to the higher values obtained by the dietary history method for these nutrients. Somewhat greater differences had been noted in a previous analysis (Young, *et al.*, 1952, a, b) based on a portion of these same data gathered early in the study.

Errors in dietary estimation may involve both the size and frequency of food servings. There is a general tendency to overestimate the size and to underestimate the frequency (because of omissions). (Young, *et al*, 1952 b, 1953). A review of the original records suggested that the overestimation of serving sizes may have been greater in the interviews (because of a tendency of the men to make a good impression) than in the seven-day records. In keeping the seven-day records, the men frequently had an opportunity to check their estimates by measuring the serving sizes, or they may have had help from their wives, who were probably more experienced in judging food quantities.

Underestimation of the frequency of servings in the seven-day records may have occurred because of omissions as the subjects' enthusiasm for keeping the records declined, despite the generally cooperative attitude of the workers. A few of the records appeared to be less complete the last few days of the week. Omissions from the dietary histories on the other hand,

were largely avoided by the cross-check (Northeast Region, 1951), and in some cases there seemed to be a tendency to over-estimate rather than underestimate the frequency of servings in the histories. For example, there was a tendency for the men to say they had certain amounts of milk and vegetables *every day*, when it is more probable that they consumed that much most days, and less on other days. Overestimation of these foods in the dietary histories would largely account for the higher history values for calcium, phosphorus, vitamin A, ribo-flavin, and ascorbic acid.

In view of the foregoing observations on sample differences, probable overestimation in the dietary histories, and underestimation in the seven-day records, the best estimate of the average dietary intake of this group of workers is thought to lie somewhere between the values obtained by the histories and the seven-day records.

Table 5 lists the per cent of subjects who had "high," "moderate," and "low" intakes of each nutrient, as calculated from both the histories and seven-day records. Means and standard deviations of the intakes have been given elsewhere (Tucker, *et al*, 1952). Most striking is the observation that about one-fourth of the men had low intakes (less than 0.7 gm. per day)

Table 5. Per cent of subjects in each dietary rating.

	DIETARY RATING					
	Dietary History (606 Subjects)			7-Day Food Record (318 Subjects)		
	High	Moderate	Low	High	Moderate	Low
Protein	87	13	0	83	17	0
Calcium	54	27	18	39	30	31
Phosphorus	68	30	3	54	41	5
Iron	91	9	0	87	13	0
Vitamin A	92	8	1	75	22	3
Thiamine	62	39	0	49	50	1
Riboflavin	74	25	1	58	40	3
Niacin	86	14	0	80	19	1
Ascorbic Acid	71	28	0	46	50	4

of calcium. Furthermore, if the lower level of 0.5 gm. of calcium is considered, both kinds of dietary data showed that one out of every eighteen men consumed less than that amount per day. A study of over 100 dietary histories, selected to represent all age, income, and educational levels, showed that low calcium intakes occurred somewhat more frequently with men who had low incomes and also with men who had only grammar school educations. (Babcock, *et al*, 1954). These groups of men ate relatively less of their calories in the form of milk and dairy products than men with higher income and educational levels. In all groups, however, there was wide individual variation in milk consumption; an average of 30 per cent of the men consumed less than one cup of fluid milk per day, while 11 per cent drank a quart or more per day. Surprisingly, the breakfast habits of the men had little effect on their total milk consumption (Gates, 1954). The relative contributions of fluid milk, bread and potatoes to the nutritive values of the diets has been reported elsewhere (Steele, *et al*, 1954).

Low milk consumption by a number of the men explains why a relatively high proportion of the diets did not meet the National Research Council's recommended allowances for calcium, phosphorus, and riboflavin. Thiamine and ascorbic acid intakes were also frequently below the recommended levels (Table 5). Although the men consumed relatively large amounts of meat and enriched bread, their high consumption of unenriched bread and pastries, sweetened beverages, and candy bars probably explains the low thiamine values. The low ascorbic acid intakes frequently observed were ascribed to low consumption of leafy green vegetables and, in some cases, low consumption of citrus fruits and tomatoes. A study of 122 dietary histories revealed that only one-eighth of the men ate one serving or more of leafy-green and yellow vegetables per day and three-fourths had one serving of citrus fruit per day. Potatoes supplied about one-seventh of the total intake of ascorbic acid.

These group findings were confirmed by a separate examination of all the data for each individual. Each subject was given

a report which included a description of the basic seven food groups (United States Department of Agriculture, 1946) and specific recommendations for improving his nutritional status, based on his dietary, blood, and physical findings. No change in diet was indicated for one-fifth of the men, but half of them were advised to increase their consumption of dairy products and fruits and vegetables rich in ascorbic acid. One-fourth of the men were advised to reduce their consumption of sugars and starches.

Vitamin supplements, as previously defined, were taken by 7 per cent of the workers. These forty-one men had considerably higher blood levels of ascorbic acid, but they had more gingivitis, thickening of the bulbar conjunctiva, and changes in the tongue papillae than the men who did not take vitamin supplements. Since these two samples of men, with and without vitamin supplements, were not comparable with respect to education, income, and ethnic groups, the physical signs may be related to other dietary, medical, or environmental factors, rather than to the consumption of vitamin supplements.

Blood Findings. The per cent of subjects in each blood chemistry rating is given in Table 6. More detailed studies of the distributions are given elsewhere (Clayton, *et al*, 1953). The data for ascorbic acid confirm the dietary findings in showing that relatively high percentages of the men failed to meet the recommended standards. The blood vitamin A values were high (in agreement with the dietary history findings), but the carotene levels were relatively lower.

Physical Findings. Eighty-six per cent of the subjects were

Table 6. Per cent of subjects in each blood chemistry rating.

	BLOOD CHEMISTRY RATING		
	High	Moderate	Low
Vitamin A (595 Subjects)	94	5	1
Carotene (597 Subjects)	60	31	10
Ascorbic Acid (606 Subjects)	47	30	24
Hemoglobin (596 Subjects)	87	11	2

rated by physicians as having "good" general appearance, 14 per cent were rated "fair," and none "poor." However, 44 per

Table 7.   Per cent of subjects in each physical inspection rating (607 subjects).

	PHYSICAL INSPECTION RATING			
	Normal or Absent	Mild	Moderate or Present	Severe
Eyes:				
Blepharitis	95	5	0	0
Palpebral Conjunctiva, Inflammation	90	9	1	0
Bulbar Conjunctiva, Increased Vascularity	77	20	3	0
Bulbar Conjunctiva, Thickening	89	9	1	1
Outer Canthi, Lesions	97	3	0	0
Skin: Face—				
Nasolabial Seborrhea	93	5	2	0
Acne	97	2	1	0
Lips:				
Cheilosis (Including Angular Stomatitis)	86	12	2	0
Buccal Mucosa:				
Stomatitis	96	3	1	0
Gums:				
Gingivitis	79	10	8	3
Tongue:				
Color—	94	—	-	-
Reddened	—	—	4	-
Magenta	—	—	2	-
Papillae, Changes in	88	4	8	0
Swelling	97	—	3	-
Fissuring	93	4	3	0
Thyroid (Goiter):	100	0	0	0
Neurological Findings:	97	—	3	-
Skin—General:				
Dermatitis	96	—	4	-
Xerosis	91	5	3	1
Perifollicular Petechiae	97	—	3	-
Folliculosis	93	4	2	0
Purpura	100	—	0	-
Atrophy	98	1	0	0

cent were overweight by 10 pounds or more, and 21 per cent were underweight by that amount. The characteristics of the overweight group were nearly the same as those given in Tables 2 and 3 for all subjects. That is, there was no clear tendency for overweight to occur more frequently in any particular age, work, income, educational, religious, or ethnic group. An analysis of the dietary, blood, and physical findings from the overweight group will be reported separately.

The data in Table 7 show that gingivitis and increased vascularity of the bulbar conjunctiva were each observed in one-fifth of the subjects. Cheilosis, changes in the papillae of the tongue, thickening of the bulbar conjunctiva, and inflammation of the palpebral conjunctiva were observed in one-tenth of the men. The various physical signs observed for each individual were considered together in formulating the composite physical ratings for each nutrient, as described in the Tabulation of Data. The percentages of subjects assigned each rating are listed in Table 8. Except for thiamine and ascorbic acid, the physical findings are in general agreement with the dietary and blood findings. The use of neurological findings as the sole physical criterion of thiamine deficiency did not provide a sensitive test for that nutrient. The procedure for calculating the ascorbic acid composite physical rating made this rating also a conservative one.

Over-All Vitamin Ratings. As defined in the Tabulation of Data, these ratings were used to arbitrarily classify the nutritional status of each subject on the basis of a combination of

Table 8. Per cent of subjects in each composite physical rating (607 subjects).

	COMPOSITE PHYSICAL RATING		
	High	Moderate	Low
Vitamin A	85	12	3
Thiamine	97	2	0
Riboflavin	76	19	5
Niacin	83	11	5
Ascorbic Acid	86	14	0

AGE GROUP		WORK ACTIVITY		RELIGION	
Years	Per Cent of Total	Rating	Per Cent of Total	Religion	Per Cent of Total
TOTAL (157)	100	TOTAL (158)	100	TOTAL (158)	100
20–29	27	Very Active	42	Catholic	31
30–39	38	Active	43	Protestant	66
40–49	24	Sedentary	15	Jewish	4
50–59	8				
60–69	4				

Table 9. Distribution of subjects having suboptimal ratings for one or more vitamins according to age, physical activity, and religion.

his dietary, blood, and physical findings. Suboptimal ratings were found, for one or more vitamins, in 26 per cent (158 subjects) of the sample. Of these 158 subjects, one had a suboptimal rating for vitamin A, ten for thiamine, fifty-eight for riboflavin, forty-five for niacin, and eighty-four for ascorbic acid.

Characteristics of the group of subjects classified as having suboptimal nutrition for one or more vitamins are given in Tables 9 and 10 for comparison with the characteristics of the entire sample (Tables 2 and 3). The figures are generally simi-

Table 10. Distribution of subjects having suboptimal ratings for one or more vitamins according to income, education and ethnic group.

WEEKLY INCOME		EDUCATIONAL LEVEL		ETHNIC GROUP	
Dollars Per Adult Unit	Per Cent of Total	Grade Completed or College Years	Per Cent of Total	Group	Per Cent of Total
TOTAL (138)	100	TOTAL (156)	100	TOTAL (158)	100
5–9	4	Less than 8	18	American	34
10–14	14	8	19	English	3
15–19	31	9 or 10	20	German	8
20–24	13	11	9	Italian	10
25–29	14	12	23	Scandinavian	2
30–34	7	College 1	4	Slavic	27
35–44	4	2 or 3	2	Negro	14
45–54	9	4	6	Miscellaneous	3
55–64	4	M.S.	0		

lar except that the suboptimal group included slightly higher percentages of Protestants, men over 40 years of age, men with low incomes, men doing very active work, and Negroes; and slightly lower percentages of men with advanced educations. A critical analysis of these findings will be published separately (Babcock, *et al*, 1954).

DISCUSSION

Individually the dietary, blood, and physical findings were generally in agreement in showing that nutritional status was lower than the optimum standards for many subjects (roughly 20 per cent to 30 per cent for most of the nutrients).

It is widely recognized that each of the above measures of nutritional status is subject to certain errors and may, by itself, be an unreliable index. Pett (1945) has emphasized that the *normal* distribution of values from a healthy population will include many values lower than the usual standards, which are set high enough to meet the needs of most of the individuals in a population. A combination of dietary, chemical, and medical evaluations for each individual should provide a more reliable index of nutritional status. The arbitrarily defined overall vitamin ratings used here are one of many such combined measures that might be devised to provide indexes of nutritional status. It is recognized that any changes in the basis for the ratings, such as using the seven-day records instead of the dietary interview data, using other standards for defining the "high," "moderate," and "low" groups, or weighting the medical signs differently, might make a considerable difference in the number of subjects rated as having suboptimal nutritional status. Nevertheless, in the absence of any generally accepted procedure for integrating such diverse types of nutritional survey data, these ratings provide a basis for summarizing the data and assist in its evaluation. The finding that one-fourth of the subjects had suboptimal overall vitamin ratings confirms the separate dietary, blood, and physical findings for the group and is also consistent with the recommendations made to each subject on the basis of his individual findings.

It should be noted that this study was limited to men who were physically fit to work and had steady employment in large chemical and pharmaceutical companies. Each company had a cafeteria and at least one full-time plant physician. The study was made following the World War II period of nutrition education and adoption of the enrichment program.

Data given here and in other reports of this study lead to the following generalizations concerning the nutritional status of this group of industrial workers.

(1) No cases of acute nutritional deficiency diseases were observed.

(2) About one-fourth of the men gave some evidence of suboptimal nutrition with respect to one or more nutrients, particularly for calcium, phosphorus, thiamine, riboflavin, and ascorbic acid.

(3) Suboptimal nutrition and also obesity were observed widely throughout all education, age, income, and ethnic groups.

(4) Dietary faults frequently observed were low consumption of milk and vitamin C-rich vegetables and fruits, and high consumption of unenriched bread and pastries, sweetened beverages, and candy bars.

(5) Inadequate breakfasts and between-meal snacks of sweet foods frequently were contributing causes of unbalanced diets.

The practical implications of these findings are that measures should be taken to improve the nutrition of industrial workers by making appetizing, nutritious foods available to them at eating times and by emphasizing the desirability of selecting adequate diets. This nutrition program should be directed to all workers, rather than restricting it to certain education, age, or income groups.

The practical aspects of industrial nutrition have been discussed by others (United States Department of Agriculture, 1945; *Nutrition Reviews,* 1953; New Jersey Department of Health, 1949).

SUMMARY

Dietary, blood, and physical findings from 610 male industrial workers have been evaluated to characterize the nutritional status of that group. The evaluation has been based on individual findings for dietary nutrients, blood constituents, and physical signs, and also collectively on arbitrary combinations of these three measures for each subject.

About one-fourth of the men gave some evidence of suboptimal nutrition with respect to one or more nutrients. The dietary weaknesses observed and the practical implications of these findings have been discussed.

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FAMILY STUDIES IN THE EASTERN HEALTH DISTRICT: I. FAMILY STRUCTURE AND ITS CHANGING PATTERN[1]

Matthew Taback, Sc.D.[2]

SINCE 1922, the Eastern Health District has served as an area for the investigation of the relative risks of disease in selected population elements. One of the prerequisites for this study has been the careful description of the social structure of the population. This has been done by periodic censuses. A unique phase of these enumerations has been the operation of matching records from successive censuses when they related to the same individual or family unit. This process allows one to obtain a sequence of observations on an individual or group of individuals with respect to some specified attribute.

The difficulty experienced in obtaining accurate information on the frequency of disease entities limited the number of morbidity studies which were undertaken among families followed up through repeated surveys.

However, the accumulation of extensive data on the social characteristics of the population has allowed for the study of several problems of demographic interest and the matching feature of the censuses has provided the necessary framework for the investigation of methodological problems such as Denson's study on the accuracy of statements of age on census records (1).

CONTRIBUTIONS OF THIS STUDY TO KNOWLEDGE OF FAMILY STRUCTURE

The present investigation, through a substantial synthesis of data available from the Eastern Health District, presents

additions to knowledge on a basic problem in social dynamics, the changing structure of the family. Specifically the following contributions are made:

1. An accurate determination of the trend in mean family size as families age.

2. Demonstration of the trend in mean developmental patterns in family size for successive generations.[3]

3. Determination of individual family patterns in size and investigation of several sources of variation in this attribute.

4. Examination of the social mobility of a cohort of families. For a given cohort, this is accomplished by comparing the occupational distributions of household heads of successive age levels.

5. Presentation of individual family patterns in respect to social mobility, by describing the change with time in the occupational status of the household head of each family.

6. Investigation of the secular trend in the frequency and type of relatives present in the family at various age levels.

7. Description of the characteristics of all families present in the Eastern Health District—for each census. This series of studies is designed to demonstrate the time trend in the types of families present in an urban area. The characteristics investigated are (a) age of the household heads (b) size and density of households (c) occupational status of the household heads (d) composition of households.

8. Quantification of the relation between density and family size, and study of the time trend in this relationship.

9. Derivation of an empirical curve describing the attrition experienced in the follow-up of family units over long periods of time.

In addition, it has been possible to make several methodological contributions which may be of value to investigators in the field of family sociology. These are:

1. The properties of the principal methods for determining time changes are reviewed critically in respect to their relative precision and bias.

[3] The phrase, developmental pattern, refers to the series of changes which a family or group of families experience with time.

2. A procedure is provided for classifying the long range patterns of development in size and occupational status which are experienced by individual families.

3. The issue of the choice of family unit for studies of family life is clarified and comparison is made between results obtained in size of family when different types of units are used.

Nature of Material in the Eastern Health District

During a twenty-five year period, 1922–1947, five censuses have been taken in Wards 6 and 7 (old area) of the Eastern Health District which since 1933 has been an administrative unit of the Baltimore City Health Department. (*See* Figure 1.) The dates of· the separate censuses, the supervision exercised, and the type of enumerators employed are summarized in Table 1. With the exception of the 1936 census, which was undertaken in conjunction with the National Health Survey, all enumerations were closely planned and supervised by a member of the Department of Biostatistics or Epidemiology of the Johns Hopkins School of Hygiene. These surveys may be considered, therefore, as phases of a serial investigation under a constantly operating agency. During the course of the twenty-five year period, the household as defined below has been the unit of observation and all persons therein except visitors were considered as household members.

A uniform coding procedure has been utilized throughout all surveys for most of the major variables. In addition, for each person enumerated, a search was made in censuses 2, 3, 4, and 5 to ascertain whether the individual concerned was present in prior surveys and if so, in what relationship to the head of the household. Punch cards were prepared for each person enumerated in each census and can be linked over several censuses through a seven digit number which is permanently assigned to an individual. Household schedules for each census have been retained and are filed alphabetically.

To facilitate linkage in the coding operation, an index of individuals enumerated in one or more of the censuses is main-

Fig. 1. Baltimore City Health Department Eastern Health District. Numbers shown represent census tract designations.

Table 1.   Selected details of the Eastern Health District surveys during the period 1922–1947.

| Survey Number | Period of Enumeration | Extent of Survey | | Supervised By | Nature of Enumerators |
		Area	Number of Households		
1	August, 1922	Ward 7	7,256	Johns Hopkins School of Hygiene Department of Epidemiology	Public Health Nurses of Baltimore City Health Department
2	July–August 1933	Wards 6 and 7	13,705	Johns Hopkins School of Hygiene Department of Biostatistics	Public Health Nurses of Baltimore City Health Department
3	November–April 1935–1936	Wards 6 and 7	13,942	National Health Survey United States Public Health Service	Persons drawn from the Works Progress Administration
4	June–July 1939	Wards 5, 6, 7, 10 Tract 3, 4, 7 of Ward 8	27,123	Johns Hopkins School of Hygiene Department of Biostatistics	Nurses of the City Health Department and College Students
5	July–October 1947	Wards 5, 6, 7, 10 Tract 3, 4, 7 of Ward 8	27,237	Johns Hopkins School of Hygiene Department of Biostatistics	Nurses of the City Health Department and College Students

tained in soundex order, each index card providing information concerning the history of enumeration for the given individual. In addition, an index of structures is maintained by street and gives data for each census relating to the households present and their schedule numbers. It will be apparent that an elaborate mechanism has been constructed to assure a reasonably precise linking operation.

As indicated earlier, one of the principal objectives in all surveys has been an accurate description of the composition of the enumerated households. The household characteristics which have been delineated throughout the course of the Eastern Health District Surveys are:

1. Concerning the Household:
   A. Total number of persons.
   B. Number of children under seven.
   C. Number of children under fifteen.
   D. Number of wage earners.
   E. Number of rooms occupied.
   F. Socio-economic status.
   G. Type household.

2. Concerning the family of the head (primary family unit):
   A. Total number in unit.
   B. Number of children under seven.
   C. Number of children under fifteen.
   D. Number of wage earners.

3. Concerning the head of household:
   A. Age.
   B. Marital status.
   C. Occupational grouping.
   D. Race and sex.
   E. Past enumeration history.
   F. Permanent individual number.

A more detailed summary of the items which have appeared from time to time on the census schedules for the special Eastern Health District Surveys will be found in a recent paper by Fales. (2)

COMPARISON OF THE EASTERN HEALTH DISTRICT AND
BALTIMORE CITY

The inferences which may be drawn from the material presented in this investigation so far as broader population groups are concerned depend upon the representativeness of the Eastern Health District with respect to other defined areas. Previous authors have discussed this issue in detail (3, 4). To avoid unnecessary duplication, we shall present only several of the main findings of these studies.

The Eastern Health District is composed entirely of row houses, with 97 per cent of the structures having been built prior to 1920. The rows are more uniform in size and architecture than those in the newer sections of the City.

The median percentage of homes owned in the District for both races and combined is twenty per cent below that for the City. There is a somewhat larger proportion of skilled and semi-skilled workers in the white population than is found in the City and a corresponding deficiency in professional and clerical groups. The Eastern Health District has always had a somewhat larger proportion of foreign-born individuals than the remainder of the old City due to an excess of persons of Czechoslovakian origin.

The age distribution of white household heads in the district does not differ greatly from that of the City. An increasing proportion of the colored population in the City has found residence in the Eastern Health District, an effect which has been controlled in our analysis by pursuing race specific distributions only.

The Eastern Health District has shown close resemblance to the rest of the City in its size of family distributions for the white segment. In the colored families, there has been a definite excess of larger units in the study area than will be found in the City.

Extension of observations made on the basis of the Eastern Health District should be undertaken with extreme caution.

However, this area is not markedly biased in relation to the remainder of the City. Trends observed in the District may serve as fairly good first approximations to the problem of describing changing characteristics of the family structure in urban communities.
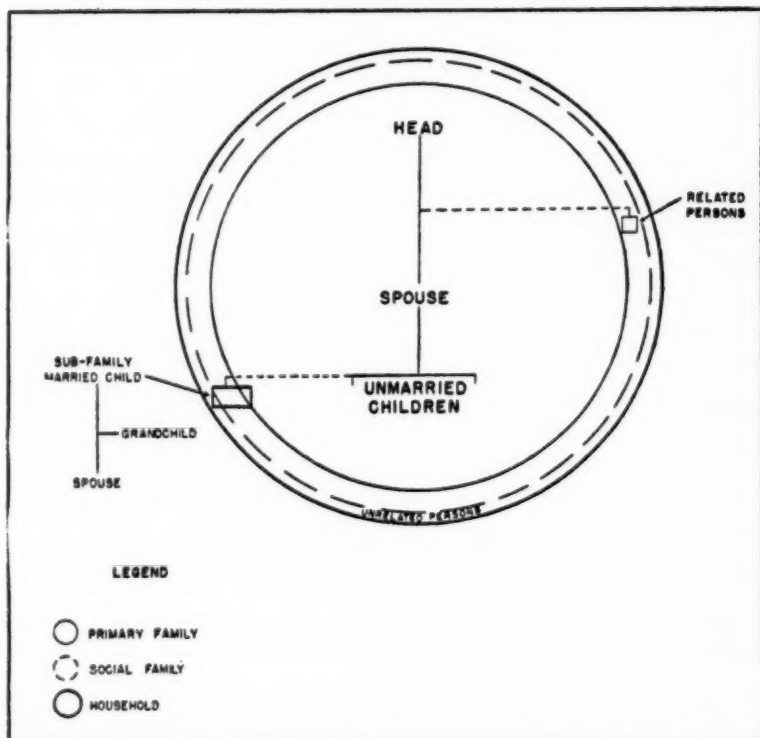
DEFINITION OF TERMS

The family may be defined in several different ways:

1. "Household":

An aggregate of one or more persons who occupy a dwelling unit. This unit includes all persons, whether related or not, who share the facilities of a house, apartment, or a group of rooms, with cooking and sleeping quarters.

Fig. 2. Organizational model of household.

HEAD

RELATED
PERSONS

SPOUSE

SUB-FAMILY
MARRIED CHILD

UNMARRIED
CHILDREN

GRANDCHILD

SPOUSE

LEGEND

PRIMARY FAMILY

SOCIAL FAMILY

HOUSEHOLD

2. "Social Family" Unit:

An aggregate of individuals, related by blood, marriage or adoption and living in one place. It excludes lodgers and other unrelated residents of the household.

3. "Primary Family" Unit:[4]

A group restricted to the household head, his spouse and children. It includes unrelated persons and relatives by marriage or by blood relationship other than children. It excludes married children, the latter constituting a subfamily when spouse or offspring are present.

Relationships among these units are shown diagrammatically in Figure 2.

CHOICE OF FAMILY UNIT FOR STUDY PURPOSES

The type of unit used in an investigation must depend upon the purpose of the study. The following examples may be of assistance on this point.

Situation 1. It is desired to estimate the total person-years coverage which a block of families will require x years hence in a Blue Cross type program. The program extends benefits to the household head, his spouse and minor children.

The most appropriate unit whose developmental pattern will have significance in this situation is the "primary family." By definition, this unit most closely resembles the group in which the program is interested.

Situation 2. It is desired to investigate the feeding patterns of family aggregates as a function of family size.

By definition, members of the social family eat from a common table. It is reasonable to assume that the needs of each individual will play some part in determining the nature of the foods consumed. Therefore it would seem that the social family is most appropriate as the unit of study here.

Some question may be raised whether the household is not the best unit since lodgers are apt to participate in the family

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[4] This unit should not be confused with the "primary family" as employed recently by the Bureau of the Census, which includes the sub-family. See *Current Population Reports*, Series P-20, No. 38, April, 1952.

circle at meal times. The decision must rest on some under-
standing of the role of the lodger.

Situation 3. The distribution of the family aggregate in re-
spect to density of housing is required.

By definition, density is derived by relating total persons in
a dwelling unit to the available room space. The household
is then the most appropriate unit for study.

Situation 4. It is desired to appraise the relative contribu-
tions of heredity and household exposure to risk of attack by
tuberculosis.

The household becomes a logical candidate for study since
the analytical design depends upon separating the experience
of the total household into well defined segments as follows:

<div align="center">

Total Household Members Exposed
Blood Relatives   "
Relatives by Marriage   "
Non-related Members   "

</div>

In the current study, we are interested in an aggregate
wherein each individual plays a significant role in the daily
function of the group, affecting its social structure and being
affected in turn by such interaction.

With this objective in mind, the primary family appears to
be too narrow a concept as it excludes, in a large proportion of
household aggregates, related individuals who participate in an
important manner to the life of the primary core. The social
family unit would appear to be the most appropriate unit, in a

Table 2. Percentage distribution of households by composition and race
Ward 7, successive censuses.

HOUSEHOLD COMPOSITION	WHITE					NON-WHITE				
	1922	1933	1936	1939	1947	1922	1933	1936	1939	1947
TOTAL HOUSEHOLDS	100	100	100	100	100	100	100	100	100	100
Primary Family Only	71	72	73	74	71	49	52	53	56	52
Primary Family and Relatives	24	24	23	21	24	27	30	29	28	32
Primary Family and Unrelated Persons	5	4	4	5	5	24	18	18	16	16

consideration of the white population. However, as will be seen from Table 2, the household and the social family group are identical units in all but 5 per cent of white aggregates. The choice between these family types is, therefore, not critical. In the Negro population, there are a large proportion of family units which include non-related members. The part which these members play in the life of the Negro household is not known. If these individuals play a real role in the function of the Negro family, the household would represent the most meaningful unit of observation for investigation of family structure.

Since the choice between social family and household in the white population is not a critical one, and assuming that in the colored population non-related members in the household participate closely in the daily function of the family aggregate, it is felt that the household constitutes the most feasible unit to investigate in studies of family structure.[5]

Before proceeding, however, it may be desirable to outline some of the relationships obtaining between the household as an entity and the other family aggregations.

RELATION OF FAMILY UNITS

By definition, the household and primary family are identities when no relatives or lodgers are present in the dwelling unit. Similarly the household and social family unit are identical when non-related persons are not present. In Table 2, it will be noted that among white households slightly more than one-fourth are composed of a primary family unit plus additional elements. In all but 5 per cent, the white households are equivalent to social family units. The distribution of a population of households in respect to a dimension such as size will, therefore, approximate closely the distribution exhibited by social family units.

In contrast, a description of the size of aggregates based on the household unit will provide a biased picture in respect to the size distribution of the primary family units. In Table 3,

[5] The term, family, hereafter, will refer to the household unit.

the relation existing between these distributions is shown for a group of households enumerated in the 1947 census. For all sizes of the primary family unit (with the exception of the extremely large units) the mean size of the corresponding house-

Table 3. Household size according to size of primary family sample of households, Eastern Health District, 1947.

SIZE OF PRIMARY FAMILY (NUMBER OF PERSONS)	RELATIVE SIZE OF CORRESPONDING HOUSEHOLD					
	Total House-holds	Primary Family Only (PF)	PF + 1	PF + 2	PF + 3 or More	Mean Size
WHITE						
TOTAL	4,000	2,866	507	313	314	3.44
1	567	252	128	88	99	2.2
2	1,295	919	131	117	128	2.7
3	955	745	105	56	49	3.4
4	601	472	83	32	14	4.3
5	334	268	42	9	15	5.3
6	126	107	9	7	3	6.3
7	64	54	5	2	3	7.3
8	30	24	4	–	2	8.3
9	18	16	–	1	1	9.3
10	4	3	–	1	–	10.5
11	4	4	–	–	–	11.0
12	2	2	–	–	–	12.0
Mean Size 2.95						
NON-WHITE						
TOTAL	1,523	819	257	184	263	4.20
1	279	93	66	47	73	2.8
2	525	280	87	59	99	3.2
3	260	160	36	27	37	4.0
4	179	106	30	23	20	4.9
5	109	64	16	16	13	6.0
6	56	43	6	3	4	6.5
7	49	27	7	6	9	8.1
8	35	24	4	–	7	8.8
9	16	12	2	1	1	9.4
10	8	5	1	2	–	10.6
11	2	–	2	–	–	12.0
12	5	5	–	–	–	12.0
Mean Size 3.04						

hold is greater. Whereas the average size of the primary family unit was 2.95 persons, the average for the household was 3.44.

Among Negro households, the primary family as the sole entity constituted only 52 per cent of such units. There is a strong tendency for Negroes to form aggregates which are based on the model of a primary family core combined with related or non-related members. The relationship which exists between the size of the primary family and that of the associated household is shown in Table 3. As previously shown for white households, the mean number of individuals in the household exceeds that of the corresponding primary unit at most levels.

It is of interest to note further that for a specified primary family size, the corresponding mean household size for Negro units is greater than that of the associated white household. This is probably due to the greater frequency of relatives and lodgers in Negro households than is found in white units.

Further information on the manner whereby inferences on social structure may be influenced by the choice of family unit, is provided by Table 4.

Consideration of the mean sizes of the primary family units would lead to the conclusion that family units in the two racial groups show little difference. Examination of the mean sizes of the household units provides a different story. The Negro household is larger by 22 per cent than the equivalent white aggregate.

It is important, therefore, to consider that statistical data on the Negro household unit should not be compared, without

Table 4.   Mean size of the primary family unit and of the household by race; sample of households, Eastern Health District, 1947.

Race	Mean Size of Primary Family	Mean Size of Household
White	2.95	3.44
Non-white	3.04	4.20

adjustment, with family data which relates to the primary family unit.

SIZE OF HOUSEHOLD

As indicated in the discussion of the choice of family unit, we shall be concerned with the total number of individuals living in a dwelling unit as a social aggregate. When two or more family type units were enumerated in the same house, they were considered as a common household if they ate at a common table served from the same kitchen. However, if they had common kitchens but did not eat at the same table and supervised their own sleeping quarters they were considered separate households.

Members of the household in an institution were not considered in the household unless they had been present within the census year.

A person living alone in an apartment constituted a household.

HEAD OF HOUSEHOLD

The determination of the household head can be made on any or a combination of factors. Some of these are: principal wage earner; responsibility for decisions relating to choice of home; responsibility for decisions relating to education of children; responsibility for decisions relating to size of family, etc. The choice might also be made on the basis of general acceptability of a given individual as head by the remaining family members. These criteria demand an intensive analysis of the daily function of the household, a procedure beyond the capabilities of an operation concerned with thousands of household units.

In the series of surveys conducted in the Eastern Health District, we have employed the following technique of establishing the household head.

For all families with married couples as the primary unit of structure, the husband was considered the head. However, if the husband was reported as physically or mentally incapaci-

tated, the wife was recorded the head of the household, if she so designated herself on enumeration.

For all families where the primary structure did not include a married couple, the statement of the respondent was accepted in designating a head of household.

DENSITY

A commonly used index to measure crowdedness in a household is obtained by dividing the total number of individuals enumerated in the family by the number of rooms available for living space (exclusive of toilet and closet facilities). The resulting index, number of individuals per room, is a measure of the population density in the household. This index is not available for the 1933 survey because the number of rooms counted included the bathroom (when present) which was excluded in all other censuses.

SOCIO-ECONOMIC STATUS

The occupation of the head of the household has been employed throughout the Eastern Health District surveys to provide an index of the social and economic status of the family. Some studies involving the relationships between occupational status and various other measures of socio-economic status were initiated by Fales. (5) Treating census tracts as units of observation, the following correlations were found among the stated variables, based upon data from the 1950 census and using the ranking technique for occupational status which will be described in part 2 of this study.

Correlated Variables	*Correlation Coefficient*
1. Occupational Rank-Monthly Rent	.55
2. Occupational Rank-Value of 1 DU Structure	.79
3. Occupational Rank-Family Income	.87
4. Occupational Rank-Years of School Completed	.87

Whenever the family status could not be established on the basis of the occupation of the household head, a set of rules

was used to obtain this measurement based upon the occupation of the other members of the household.

COMPOSITION OF THE HOUSEHOLD

Family aggregates have been classified according to composition on the basis of four attributes as shown below:

- a. Sex of the head of the household.
- b. Presence or absence of children.
- c. Presence or absence of relatives.
- d. Presence or absence of unrelated persons.

If it is assumed that each one of these components has two possible outcomes, this type of classification provides 24 categories. For analytical purposes, this number has been reduced by combining components c. and d.

CROSS-SECTIONAL ANALYSES OF FAMILY STRUCTURE

In this section, the characteristics of families enumerated in each census are described. The presentation is designed to show how the family composition of the study area has changed and in what respect it has remained stable. The variables investigated are: age of the household heads, size and density of households, occupational status of the household heads, and composition of the households.

The changes noted may provide useful information to the analyst who is concerned with events whose frequency may be associated with one or more of the above variates. Thus, for example, the investigator interested in historical trends in the rate of juvenile delinquency in an area, or in the age of attack by specific communicable diseases may find it profitable to consider such trends in the light of the changing patterns in the types and sizes of families resident in the study area.

The cross tabulation of size, occupational status, and composition of the family with the age of the head of the household furnish data which will be used later in a discussion and evaluation of methods for estimating age changes in family structure.

YEAR OF CENSUS	WARDS 6 AND 7			WARD 6			WARD 7		
	Total	White	Colored	Total	White	Colored	Total	White	Colored
1922	7,256	6,069	1,187	Not available			7,256	6,069	1,187
1933	13,705	10,832	2,873	6,653	5,614	1,039	7,052	5,218	1,834
1936	13,942	10,916	3,026	6,646	5,582	1,064	7,296	5,334	1,962
1939	15,245	11,840	3,405	7,195	6,026	1,169	8,050	5,814	2,236
1947	14,626	10,813	3,813	6,982	5,754	1,228	7,644	5,059	2,585

Table 5.   Number of households by ward and race according to year of census, Eastern Health District, Baltimore.

The number of households available for cross-sectional studies is shown in Table 5. Data for 1922 are available for Ward 7 only. In later censuses, information is provided for Wards 6 and 7 separately and combined. It will be noted that the colored families have represented a fairly constant proportion (16–17 per cent) of the total households in Ward 6, whereas this proportion has increased from 16 to 34 per cent over a twenty-five year interval in Ward 7.

In order to study time trends, data are presented separately by race and ward. Where ward differences are not of any significance, these areas have been combined and a single body of data or index has been developed for the district.

AGE OF HOUSEHOLD HEAD

Distributions by age and race of the household head are summarized in Tables 6 and 7. To assist in the interpretation of this information, the distributions are shown graphically in Figure 3.

Over the twenty-five year period covered by this material, there has been very little change in the average age of white heads of households. In view of the similarity of Wards 6 and 7 in respect to this variable, we shall concern ourselves with the information for the entire District. In 1922, the mean age was 44.7 years, rising to 47.0 in 1933 where this index remained fairly constant until the census of 1947 gave indication of a further rise to 48.2. Employing the standard deviation as a measure of variance, it is noted that there has been a tendency

INDEX	WARD 7					WARD 6				
	1922	1933	1936	1939	1947	1922¹	1933	1936	1939	1947
Total Households	6,069	5,218	5,334	5,814	5,059		5,614	5,582	6,026	5,754
Mean Age of Head (Years)	44.7	47.0	47.1	46.0	48.6		47.1	47.5	47.2	47.8
Standard Deviation (Years)	13.1	13.5	14.0	15.8	14.6		13.6	13.4	13.5	14.9
Age in Years for Specified Percentiles²										
3	24.6	25.1	24.2	23.8	24.4		25.2	24.8	24.7	22.9
25	34.0	36.7	36.1	34.7	36.8		36.5	36.7	36.3	35.8
50	43.0	45.6	46.0	45.8	48.1		45.6	46.2	46.3	47.3
75	53.8	56.3	56.8	56.5	59.7		56.4	57.4	57.1	58.7
97	72.6	74.3	74.7	74.2	75.7		74.3	74.5	74.6	76.2

Table 6. Selected indices of the age distribution of white heads of households, by ward for each special census.

¹ Not available.
² Ward 7 only.
³ The 3rd and 97th percentiles are provided as estimates of the mid 95 per cent range, commonly employed for descriptive purposes in the Handbook of Biological Data prepared by the National Research Council.

for ages of households heads to become more broadly distributed about the mean age. A review of Figure 3 gives indication of a distribution of white households which has moved from a slightly skewed form in 1922 to a remarkably symmetrical shape in 1947.

The time trend of average age for non-white heads of house-

Table 7. Selected indices of the age distribution of non-white heads of households by ward for each special census.

INDEX	WARD 7					WARD 6				
	1922	1933	1936	1939	1947	1922¹	1933	1936	1939	1947
Total Households	1,187	1,834	1,962	2,236	2,585		1,039	1,064	1,169	1,228
Mean Age of Head (Years)	41.8	40.3	41.3	41.6	44.1		40.5	41.4	42.1	43.8
Standard Deviation (Years)	11.8	11.3	11.5	11.5	12.1		11.8	12.3	10.3	12.9
Age in Years for Specified Percentiles										
3	24.0	23.0	24.2	23.6	24.2		22.8	22.6	24.0	23.8
25	32.8	31.5	32.5	32.9	35.2		31.2	31.8	32.3	33.4
50	40.0	38.7	39.4	39.8	42.9		38.4	39.4	39.6	41.8
75	49.7	46.7	47.7	48.2	51.6		47.9	48.6	49.2	52.2
97	72.0	64.6	68.4	68.1	70.9		67.9	70.4	70.7	72.4

¹ Not available.   ² Ward 7 only.

WARDS 6 AND 7				
1922²	1933	1936	1939	1947
6,069	10,832	10,916	11,840	10,813
44.7	47.0	47.3	46.6	48.2
13.1	13.6	13.7	14.7	14.7
24.6	25.2	24.5	24.3	23.5
34.0	36.6	36.4	35.5	36.3
43.0	45.6	46.1	46.0	47.7
53.8	56.4	57.1	56.8	59.2
72.6	74.4	74.6	74.4	76.0

holds has followed generally the same course as previously given for the white population of households. Inspection of Table 7 indicates that this index has increased from 41.8 years in 1922 to 44.0 in 1937. Throughout, the mean ages for non-white households have remained consistently lower than those recorded among white segments. With regard to variability about the mean age of the household head, the Negro units have shown less deviation than that observed among white units. Furthermore, there does not appear to be a consistent movement in this attribute with the flow of time.

SIZE OF HOUSEHOLD

From a historical point of view, and in the developmental course of individual family units, there is no greater change in a measurable characteristic of the family structure than that which takes place in respect to the size of household. The changes in household size recorded by the Bureau of the Census during the interval 1890–1950 provide an interesting country-wide documentation of the declining trend in this characteristic. The data are shown in Table 8.

The material in the Eastern Health District provides a picture of the changing size of the household unit in a relatively stable environment so far as physical structure and socioeconomic class are concerned. In Tables 9 and 10 some of the more important indices are shown by race for the size distribution of all households enumerated at given censuses. Among white units, there

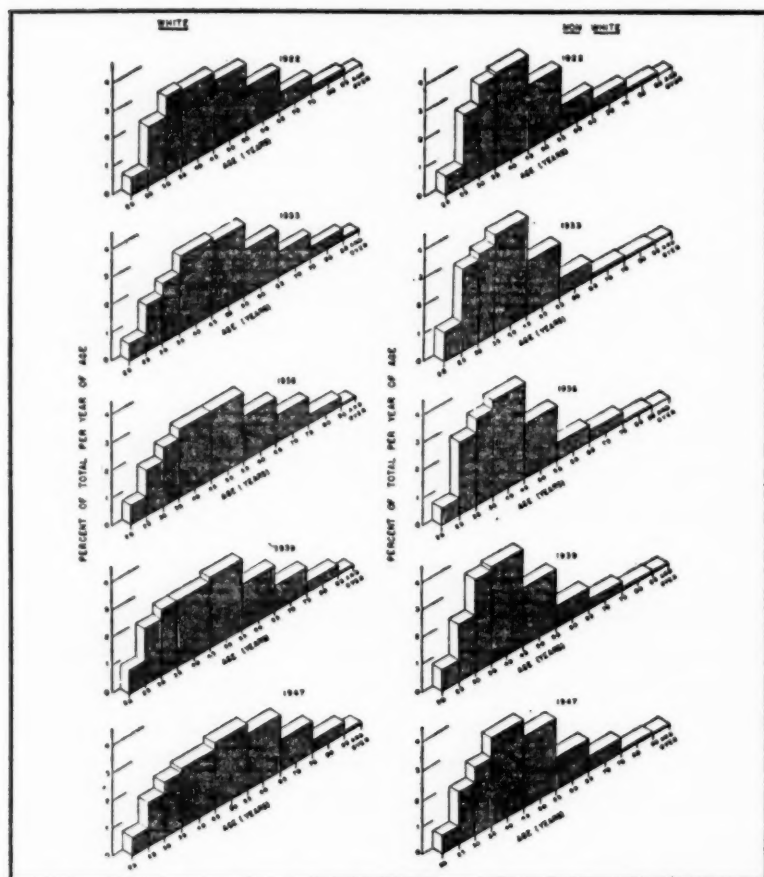| WARDS 6 AND 7				
1922²	1933	1936	1939	1947
1,187	2,873	3,026	3,405	3,813
41.8	40.4	41.3	41.9	44.0
11.8	11.5	11.7	10.8	12.5
24.0	22.9	23.5	23.9	24.0
32.8	31.4	32.2	32.7	34.6
40.0	38.6	39.4	39.8	42.6
49.7	47.1	48.0	48.6	51.8
72.0	65.6	69.5	69.1	71.5

Fig. 3. Age distribution of household heads, Eastern Health District, Baltimore, successive census years.

is consistent decline in mean household size from 4.3 in 1922 to 3.4 persons per household in 1947. Also of interest is a decline in the standard deviation of the size of white household units from 2.0 to 1.7 over the same interval.

A study of Figure 4 furnishes an interesting indication of the trend towards smaller white families. Among the white households, those with two and three members have increased from 38 per cent of the total in 1922 to more than 50 per cent of the total in 1947. In addition, there is steady increase in the

relative frequency of the households with only one member present. Correspondingly, there are declines to be noted in the percentage occurrence of households of five or more members.

Non-white households do not show any definite trend in size over the period of this study. A decline in mean size of household in Ward 7 from 4.6 to 4.3 members during the interval 1922–1936 has not continued since this latter period. No time change of sociological significance is found in Ward 6. It is worth noting, however, that there is a consistent smaller size for the average household in Ward 6 than in Ward 7. Also throughout the period 1922–1947, Negro households have been larger than those of the whites.

The trend in frequency of large families is of interest. Confining ourselves to Ward 7, we find that over the period 1922–1947, the percentage of households with five or more members has declined in the white community from 40 per cent to 22; the equivalent trend in Negro family units has been a slight drop from 41 to 38 per cent.

Size of Household and Age of Household Head

For a given census, the variation in household size with the age of the household head gives some indication of the trend which groups of family units may follow with the passage of time. It should be kept clearly in mind, however, that cross-

Table 8. Average size of household United States and Eastern Health District[1], 1890–1950.

YEAR	AVERAGE POPULATION PER HOUSEHOLD	
	United States	Eastern Health District
1890	4.93	
1900	4.69	
1910	4.54	
1920	4.34	4.3
1930	4.01	4.0
1940	3.67	3.6
1950	3.39	3.4

[1] Figures shown for Eastern Health District are based upon special survey data for white households in those years which most closely approximate the decennial census years.

INDEX	WARD 7					WARD 6				
	1922	1933	1936	1939	1947	1922	1933	1936	1939	1947
Total Households	6,069	5,218	5,334	5,814	5,059		5,614	5,582	6,026	5,754
Mean Size[1]	4.3	4.0	3.8	3.6	3.4		4.0	3.9	3.7	3.5
Standard Deviation	2.0	2.0	1.9	1.8	1.6		2.0	1.9	1.9	1.8
Size of Household at Specified Percentiles										
3	1.5	1.1	1.2	1.0	1.0		1.1	1.1	1.0	1.0
25	2.8	2.5	2.4	2.3	2.2		2.5	2.5	2.3	2.2
50	4.0	3.7	3.5	3.3	3.2		3.7	3.6	3.4	3.2
75	5.4	5.1	4.9	4.5	4.3		5.2	5.0	4.8	4.4
97	8.5	8.5	8.2	7.5	7.1		8.5	8.3	8.0	7.6

Table 9. Selected indices of the size distribution of white households by ward for successive census years.

[1] Expressed in number of individuals.

sectional profiles by age place in apposition groups of families which are not strictly comparable except under a static concept of social change.

The mean size of household for white and non-white families is shown graphically in Figure 5, for each census according to the age of the head of household. Consideration of the material on white families leads to the following observations:

    a. The size function is generally of a parabolic type.

Table 10. Selected indices of the size distribution of non-white households by wards in successive census years.

INDEX	WARD 7					WARD 6				
	1922	1933	1936	1939	1947	1922	1933	1936	1939	1947
Total Households	1,187	1,834	1,962	2,236	2,585		1,039	1,064	1,169	1,228
Mean Size[1]	4.6	4.5	4.3	4.2	4.3		3.9	3.9	3.7	4.0
Standard Deviation	2.6	2.4	2.3	2.3	2.3		2.3	2.3	2.2	2.3
Size of Household of Specified Percentiles										
3	1.3	1.5	1.5	1.0	1.0		.9	.9	.8	.9
25	2.6	2.6	2.5	2.4	2.4		2.1	2.1	1.7	2.2
50	4.0	4.0	3.9	3.7	3.7		3.3	3.2	3.1	3.4
75	5.9	5.8	5.7	5.6	5.6		5.1	5.2	4.9	5.3
97	9.7	9.7	9.7	9.6	9.6		9.4	9.2	9.0	9.4

[1] Expressed in number of individuals.

WARDS 6 AND 7				
1922	1933	1936	1939	1947
6,069	10,832	10,916	11,840	10,813
4.3	4.0	3.9	3.6	3.5
2.0	2.0	1.9	1.8	1.7
1.5	1.1	1.1	1.0	1.0
2.8	2.5	2.5	2.3	2.2
4.0	3.7	3.6	3.3	3.2
5.4	5.1	5.0	4.6	4.4
8.5	8.5	8.3	7.8	7.3

b. Maximum size is present between 40 and 45 years of age of the household head.

c. The curves for the separate census years are displayed downward as one proceeds from the earliest to the later censuses.

d. The percentage decline in size does not differ markedly from one age group to another.

For non-white households, the characteristics of the curves shown are not as clearly defined as those noted for white households. Variation in size with change in age is not apparent in 1922. In 1936 and 1947, there is some evidence of a parabolic trend to the curves drawn with maxima within the age range 40–50. The slopes, however, denoting change in size with age, are flatter than those observed for white families.

DENSITY OF HOUSING

In a discussion of household size, the subject of density of housing immediately proposes itself. If one is concerned with the number of close physical contacts which occur between household members, it is appropriate to consider the relation

WARDS 6 AND 7				
1922	1933	1936	1939	1947
1,187	2,873	3,026	3,405	3,813
4.6	4.3	4.2	4.0	4.2
2.4	2.4	2.3	2.3	2.3
1.3	1.0	1.0	0.9	1.0
2.6	2.4	2.3	2.2	2.3
4.0	4.2	3.7	3.5	3.6
5.9	5.6	5.5	5.4	5.5
9.7	9.6	9.4	9.4	9.5

of space available to household members and the number of individuals utilizing such space. A convenient index for expressing this relationship is provided by the ratio, number of persons per room.

The relation between number of persons per room and family size will be found in Figure 6. (Supporting data may be obtained from the author upon request.) The regression of density upon size of family is approximately linear. Study of the series of curves for the white
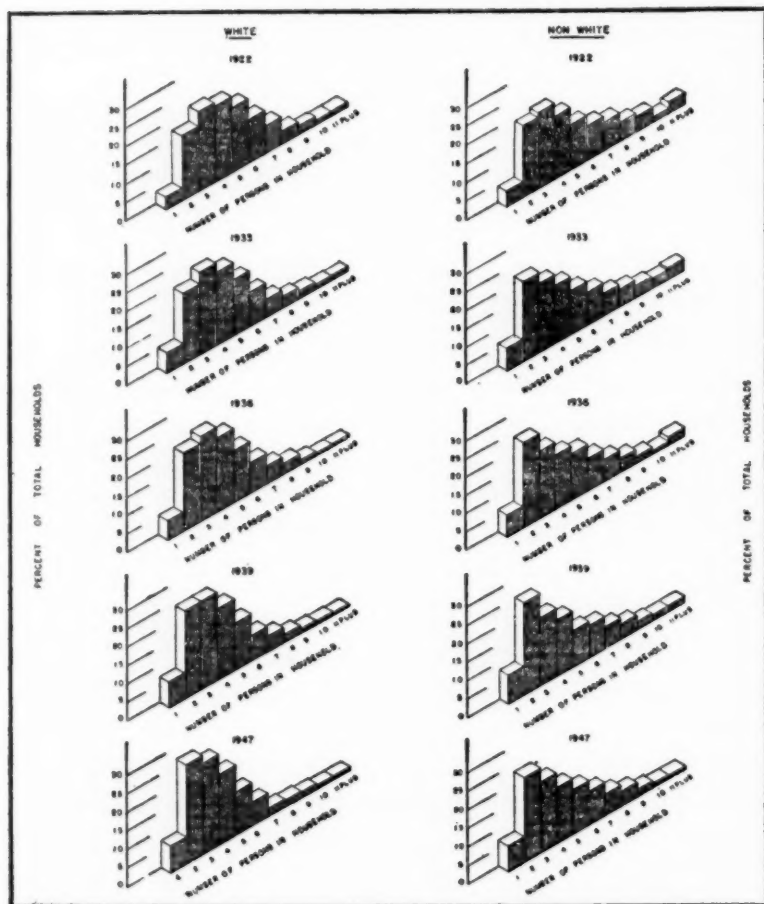
Fig. 4. Percentage distribution of households by size, Eastern Health District, Baltimore, successive census years.

segment of Ward 7 indicates an extraordinarily constant association existing between these attributes. Exact estimates of the parameters of the curves are shown at the bottom of Table 11. The slopes (b) and y intercepts (a) show no significant variation over the interval 1922–1947.

The relation between density and size of family among Negro households is somewhat different than that observed in white family units. Although there exists a linear relationship be-
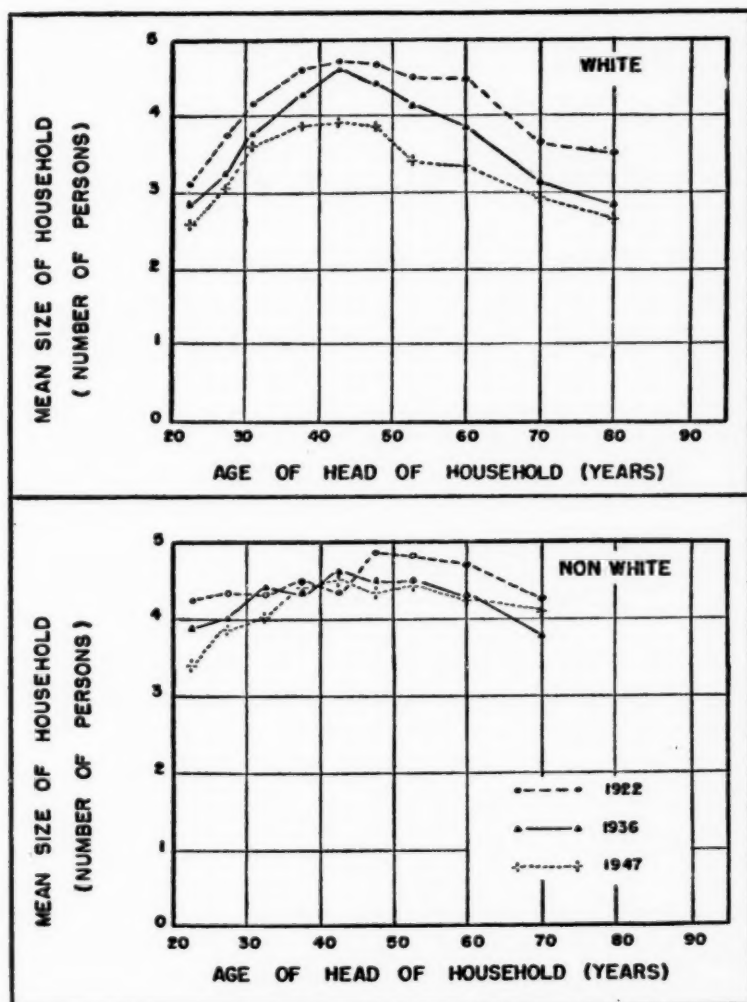
Fig. 5. Size of household by age of head of household, Eastern Health District, selected census years.

tween the variables, this association has not remained fixed in its parameters. There has been a consistent decline in the slope of the curves drawn. A 't' test of the difference in slopes between the 1922 regression and the 1947 curve fails, however, to indicate that the difference noted is statistically significant.

Table 11. Mean persons per room according to size of household and race, Ward 7—selected censuses.

Size of Household	White				Non-White			
	1922	1936	1939	1947	1922	1936	1939	1947
Total	.83	.78	.77	.73	.85	.85	.93	.99
1	.38	.32	.43	.38	.34	.38	.57	.56
2	.51	.52	.54	.52	.56	.54	.68	.76
3	.73	.75	.79	.75	.65	.70	.84	.87
4	.76	.75	.99	.77	.83	.84	.92	.96
5	.90	.92	.94	.88	.90	.92	.99	1.11
6	1.11	1.12	1.09	1.08	1.07	1.10	1.12	1.18
7	1.15	1.17	1.15	1.17	1.13	1.13	1.20	1.23
8	1.38	1.37	1.31	1.33	1.28	1.29	1.30	1.41
9	1.54	1.51	1.49	1.59	1.34	1.34	1.47	1.50
10	1.49	1.50	1.52	1.50	1.47	1.50	1.63	1.53
11	1.68	1.82	1.54	1.81	1.45	1.49	1.55	1.52
12	1.85	1.80	2.04	1.88	1.71	1.70	1.62	1.67
b^1	.135	.134	.128	.137	.116	.114	.105	.098
a	.25	.26	.30	.24	.31	.34	.48	.57
s_b^2	.006			.006	.006			.005
s_a	.041			.041	.034			.034

[1] b = slope of regression of mean number of persons per room upon size of household.
[2] s_b = standard error of the slope (b).
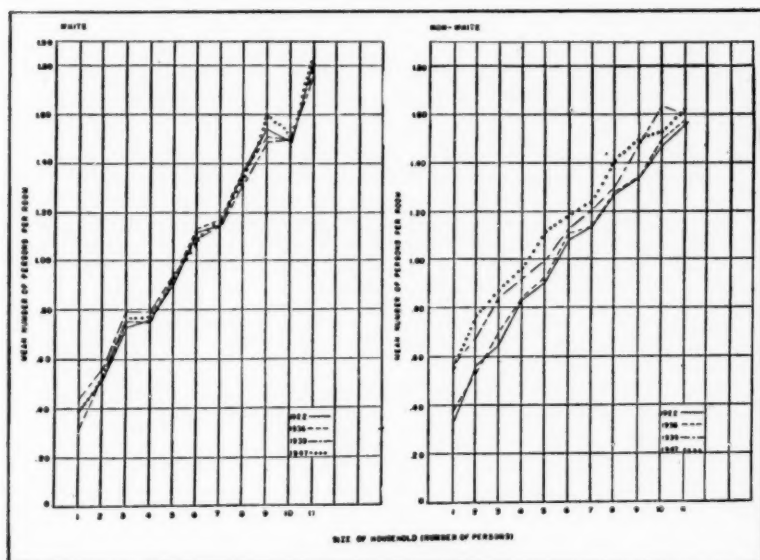
Fig. 6. Density of housing according to size of household, Ward 7, selected census years.

A test of the *y* intercepts (a) for each of the regressions shown, gives evidence of significant difference between the general level of the density functions in 1939 and 1947 and those obtained for the earlier years 1922 and 1936.

The findings cited above may be interpreted as follows:

1. Among white families, the relationship existing between density of housing and size of family is linear and positive and has been extremely constant in its dimensions over the quarter century 1922–1947.

2. Among non-white families, density is found to increase with the size of family throughout all censuses. However, during the period of 1922–1947, the density values for given family sizes have increased, an effect which is apparently more marked in the smaller households than in the larger families.

OCCUPATIONAL STATUS OF HOUSEHOLDS

In this section, the following questions are discussed:

1. Have the cross-sectional distributions of families accord-

Table 12. Occupational status of white households Eastern Health District, successive census years.

Occupational Group of Household Head	1922	1933	1936	1939	1947
Total	6,069	10,832	10,916	11,840	10,813
Professional Persons	149	338	322	392	457
Proprietors, Managers or Officials	795	1,518	1,513	1,340	957
Clerks or Kindred Workers	835	1,411	1,507	1,682	1,428
Skilled Workers or Foremen	2,318	3,492	3,123	3,327	3,740
Semiskilled Workers	1,129	2,518	3,055	3,315	3,040
Other Laborers	294	790	665	904	488
Servant Classes	105	299	327	388	341
Other Specified	7	17	12	18	5
No Occupation	115	387	385	420	357
Indefinite or Unknown	322	62	7	54	—
PER CENT[1]					
Total	100	100	100	100	100
Professional Persons	2.6	3.7	3.0	3.3	4.2
Proprietors, Managers or Officials	13.8	14.1	13.9	11.4	8.9
Clerks or Kindred Workers	14.5	13.1	13.8	14.3	13.2
Skilled Workers or Foremen	40.4	32.4	28.6	28.2	34.6
Semiskilled Workers	19.7	23.4	28.0	28.1	28.1
Other Laborers	5.1	7.3	6.1	7.7	4.5
Servant Classes	1.8	2.8	3.0	3.3	3.2
Other Specified	.1	.2	.1	.2	—
No Occupation	2.0	3.6	3.5	3.6	3.3

[1]Percentages shown are based on total households for which socio-economic group was known.

Table 13. Occupational status of non-white households Eastern Health District, successive census years.

OCCUPATIONAL GROUP OF HOUSEHOLD HEAD	1922	1933	1936	1939	1947
			NUMBER		
TOTAL	1,187	2,873	3,026	3,405	3,813
Professional Persons	31	36	41	35	33
Proprietors, Managers, or Officials	35	75	104	94	95
Clerk or Kindred Workers	24	20	47	34	109
Skilled Workers or Foremen	65	115	214	172	311
Semiskilled Workers	149	408	701	626	869
Other Laborers	554	1,512	1,137	1,623	1,456
Servant Class	239	637	682	637	799
Other Specified	8		10	13	10
No Occupation	15	45	84	147	130
Indefinite or Unknown	67	17	6	24	1
			PER CENT[1]		
TOTAL	100	100	100	100	100
Professional Persons	2.7	1.3	1.4	1.0	.9
Proprietors, Managers or Officials	3.1	2.6	3.4	2.8	2.5
Clerk or Kindred Workers	2.1	.7	1.6	1.0	2.9
Skilled Workers or Foremen	5.8	4.0	7.1	5.1	8.2
Semiskilled Workers	13.3	14.3	23.2	18.5	22.7
Other Laborers	49.5	52.9	37.6	48.1	38.1
Servant Class	21.3	22.3	22.6	18.8	21.0
Other Specified	.7	.3	.3	.4	.3
No Occupation	1.3	1.6	2.8	4.3	3.4

[1] Percentages shown are based on total household for which socio-economic group was known.

ing to occupational status changed from one census to another?

2. Does the distribution of white families according to occupational status vary from the spread noted among non-white families?

In Tables 12 and 13 households in the Eastern Health District are distributed according to the occupational groups proposed by the Bureau of Census in 1937 (6). The principal point to be noted is that the magnitude of change is small. In view of the large size of the populations involved, we may consider directly the percentage differences observed assuming that they are subject to negligible sampling variation. For the white segment, the following trends are found:

1. There is a consistent decline in the relative frequency of proprietors, managers and officials since 1936.

2. This decline is accompanied by an increase in the percentage of professional persons and skilled workers.

3. The dominant categories throughout the twenty-five year period of observation have been skilled and semi-skilled workers accounting for 60.1, 56.8, 56.6, and 62.7 per cent respectively of all households in the District. Within this group, there is evidence of some decline in the skilled worker class and an increase in the semi-skilled group over the quarter century of observation.

Inspection of the data available on the non-white segment permits the following observations:

1. There is a decline in the percentage of households assigned to the unskilled labor class from a mean of 51 per cent for the period 1922–1933 to an average of 43 per cent for the period 1936–1947.

2. There is a corresponding increase in the percentage of households in the semi-skilled class from a mean of 14 per cent for the period 1922–1933 to a mean of 21 per cent for the later eleven-year interval 1936–1947.

3. The dominant occupational groups in the earlier period of 1922–1933 were the non-skilled labor and servant classes whereas
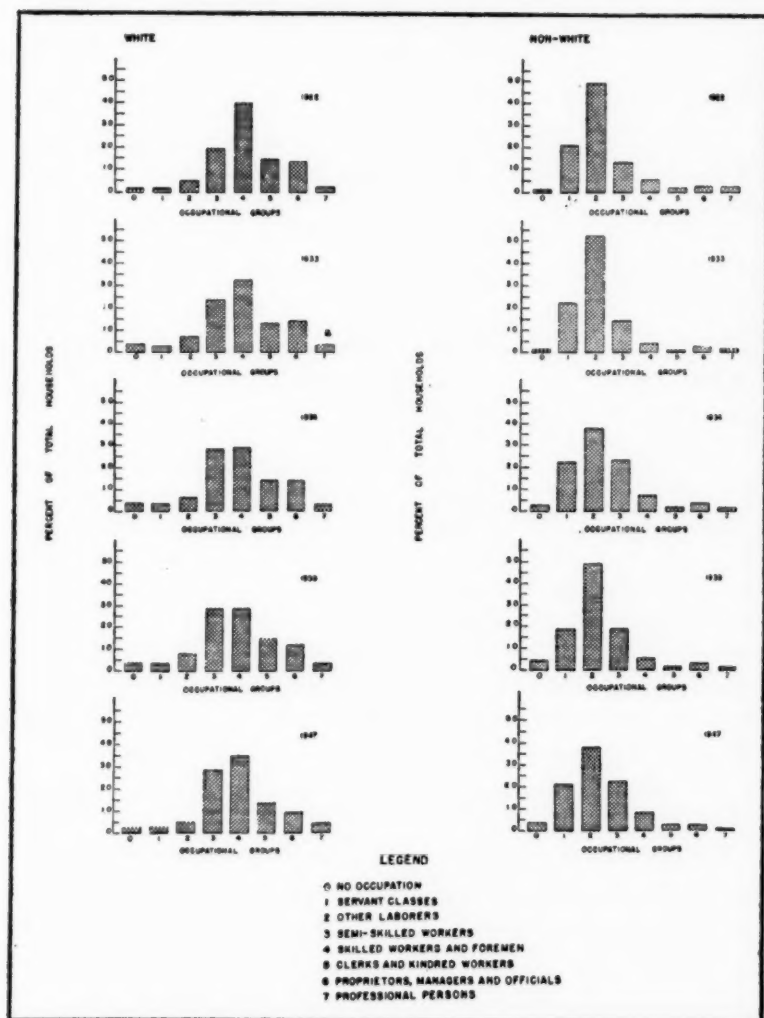
Fig. 7. Percentage distribution of household heads by occupational groups, Eastern Health District, successive census years.

the more recent years show some evidence of a shift upward of the character discussed above under (2).

The differences between the occupational distributions of the two racial groups are obvious from the accompanying chart. (Figure 7)

OCCUPATIONAL STATUS AND AGE OF HOUSEHOLD HEAD

Questions which propose themselves when considering the occupational distribution of household heads by age are:

1. Does the occupational status of families vary with the age of the household head? If so, what is the nature of the variation?

2. Have there been any changes over the interval 1922–1947 in the association of occupational status and age of household head?

In order to bring about an expeditious treatment of the mass of data which appears on these varieties, the original data have been modified as follows:

1. Occupational classes represent qualitative but reasonably ordered fractions of the universe. Each of these classes may be assigned a rank. Rank equivalents for occupational groups are shown in the legend of Figure 7. Each age group can, therefore, be assigned a mean rank for each of the census years based upon households which are classifiable.

2. Using the separate censuses as a series of columns and the various age groups as a series of rows, a matrix of mean occupational rankings may be assembled whose analysis is possible through the standard procedures of analysis of variance.

In Table 14, a distribution of mean occupational ranks for

Table 14.   Mean occupational ranks of white households according to age of household head and census year[1].

AGE OF HOUSEHOLD HEAD	1922	1933	1939	1947	MEAN
TOTAL	4.12	4.04	3.96	3.97	4.02
Under 29	4.16	4.02	3.84	3.94	3.99
30–34	4.31	4.02	3.97	4.02	4.08
35–39	4.25	4.05	3.96	3.98	4.06
40–44	4.22	4.02	4.20	4.05	4.12
45–49	3.99	4.06	3.89	4.00	3.99
50–54	4.12	4.03	3.94	3.93	4.00
55–64	3.84	4.08	3.97	3.89	3.95
65 and Over	3.98	3.98	3.93	3.98	3.97

[1] Ranks are ordered so that occupations associated with higher socio-economic strata have higher numerals assigned.

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F
Total	31	.44		
Age of Household Head	7	.15	.0214	3.20
Census Year	3	.15	.0500	7.46
Error	21	.14	.0067	

Table 15. Analysis of variance of mean occupational rankings with age of household head, white households, Eastern Health District, 1922–1947.

white units is presented according to age of the household heads and year of census. Inspection of the row means gives indication of a small increase in the occupational index as one moves from the younger ages to the middle groups followed by decline of a small order in the later ages. Analysis of the column means gives evidence of some decline for the general community in the occupational standing of the white households. The variation of occupational status with age as well as with the flow of time as measured by successive censuses has been found through analysis of variance to be statistically significant (Table 15). It may be noted however that the differences found are extremely small.

An analysis of variance of the mean occupational ranks among Negro families for the various age groups and over the twenty-five year interval gives indication of a significant variation over the years but does not point to any changes of significant proportion from one age group to another. The change over the years for all Negro groups combined is represented by the numbers 2.39, 2.25, 2.31, and 2.42 for the census years 1922, 1933, 1939, and 1947 respectively. Thus, it appears that the change recorded is of a relatively low order.

HOUSEHOLD COMPOSITION

The questionnaire design throughout the course of the special censuses in the Eastern Health District has been carefully planned to provide an accurate description of the relationship of each member in the household to the head. As a result, each

Table 16. Percentage distribution of households by age of head of household and by sex—Ward 7 successive census years.

Age of Household Head	Type of Head Structure														
	Married Couple					Female Head, No Husband					Male Head, No Wife				
	1922	1933	1936	1939	1947	1922	1933	1936	1939	1947	1922	1933	1936	1939	1947
WHITE															
TOTAL	81	76	77	76	74	15	19	18	18	20	4	5	5	6	6
Under 29	96	90	93	92	87	2	7	4	6	9	2	3	3	2	4
30-34	94	90	91	89	90	5	7	7	8	8	1	3	2	3	2
35-39	90	86	88	88	86	7	11	10	10	10	3	3	2	2	4
40-44	89	83	86	84	83	10	13	11	13	13	1	4	3	3	4
45-49	85	79	81	79	79	13	17	15	15	16	2	4	4	6	5
50-54	72	75	73	72	72	21	21	22	20	22	7	4	5	8	6
55-59	72	69	69	67	68	21	24	23	27	25	7	7	8	7	7
60-64	67	57	69	60	63	27	33	22	30	27	8	10	9	10	10
65-69	61	52	52	51	53	31	38	36	38	38	11	10	12	11	9
70-74	56	49	45	44	47	33	39	42	44	37	13	12	13	14	16
75-and Over	36	31	32	30	39	50	44	46	54	42	14	25	22	16	19
NON-WHITE															
TOTAL	75	70	70	68	69	18	23	24	24	23	7	7	6	8	8
Under 29	83	78	78	78	76	12	15	18	18	19	5	7	4	4	5
30-34	84	72	76	68	77	12	22	21	24	17	4	6	3	8	6
35-39	78	69	72	72	73	15	24	22	21	22	7	7	6	7	5
40-44	74	73	69	65	71	17	20	26	25	22	9	7	5	10	7
45-49	75	67	67	68	67	20	26	26	26	24	5	7	7	6	9
50-54	72	60	64	64	68	21	32	29	27	22	7	8	7	9	10
55-59	60	62	59	57	62	36	25	38	37	26	4	13	3	6	12
60-64	64	55	54	51	55	24	37	40	38	35	12	8	6	11	10
65-69	32	43	52	55	48	52	38	33	33	36	16	19	16	12	16
70-74	36	36	50	48	40	50	46	38	35	29	14	18	12	17	31
75-and Over	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

* Experience insufficient to determine stable ratios.

household can be readily characterized in respect to the following factors: sex of household head, presence of spouse, presence of children, presence and type of related persons, and the presence of non-related persons or lodgers.

In the subsequent analysis, each of the factors are considered individually and changes are noted when they have taken place during the 1922–1947 period from census to census and for a given census from one age group to another.

The head structure of the family is shown in Table 16. It will be seen that the married couple represents the predominant type in the younger households, but that this class progressively declines in relative frequency as one approaches the older ages. At the same time, the family headed by a female increases in its relative frequency as one passes from young families to older units. There is evidence also of an increase in families headed by a male, no wife being present, in the older age households. These trends appear to be rather consistent across all censuses.

Racial differences in respect to head of the household are of interest. In the younger families, the percentage of female heads of households is higher among Negroes than among whites. This difference does not persist, however, after age 55.

Table 17 indicates the proportion of households that have children present, according to the age of the household head. During the interval 1922–1947, there is a definite decline noted in this characteristic, which is seen at all ages of the household head and is particularly marked at the age levels above 55 years and within the age level "under 25 years." The trend of an increase in the proportion of households having children as one advances from the younger age groups to the early middle ages and a gradual decline thereafter is characteristic throughout all censuses. The maximum point in respect to white households which include children is reached generally within the age span 30–44.

The Negro households fail to show a marked trend in respect to percentage frequency of families with children, both along

Table 17. Per cent of households with children present according to age of head of household, Ward 7—successive census years.

Age of Household Head	White					Non-White				
	1922	1933	1936	1939	1947	1922	1933	1936	1939	1947
Total	77	73	72	67	63	61	61	63	58	57
Under 25	67	54	46	44	39	55	55	72	48	57
25–29	73	68	61	52	62	59	57	62	61	62
30–34	82	76	73	66	77	64	62	63	62	58
35–39	81	83	83	77	73	64	63	66	63	63
40–44	81	83	83	81	74	60	62	63	56	59
45–49	79	80	81	76	71	58	69	67	60	59
50–54	78	76	73	71	66	61	60	64	56	50
55–59	77	68	68	65	57	68	57	56	60	51
60–64	70	64	66	59	53	54	55	56	55	53
65–74	70	61	60	57	48	62	59	56	43	47
75 and Over	69	65	59	54	47	*	*	*	*	*

* Experience insufficient to determine stable ratios.

the axis of time as represented by successive censuses and along the axis of age of household head. Overall, the relative frequency of families with children is lower among Negro households than among white units. It is believed that this may be due to a greater clustering of children among Negro households than is to be found in white families.

The relative frequency of households with related persons present is given in Table 18 for both races. Among white households, there has been a positive association of this frequency with the age of the household head. Thus we find that the percentage of white households which include relatives rises from a range of 7–13 per cent for families headed by an individual less than 25 years of age to a range of 25–39 per cent for households headed by persons 55 years and older. Changes in this characteristic over the interval 1922–1947 are not particularly remarkable although it appears that a small and statistically significant decline has taken place in the age groups 55 years and over. The non-white households show no decline in respect to the proportions which include related persons, over the quarter century 1922–1947. At all age levels of the household head, the Negro family is characterized by a higher proportion with relatives than is found in the white community.

Table 18. Per cent of households with relatives present according to age of head of household, Ward 7, Eastern Health District of Baltimore, in successive census years.

AGE OF HOUSEHOLD HEAD	WHITE					NON-WHITE				
	1922	1933	1936	1939	1947	1922	1933	1936	1939	1947
TOTAL	24	25	23	21	24	27	30	29	28	32
Under 25	13	12	10	7	11	27	31	22	20	14
25–34	14	18	15	12	14	24	24	24	21	22
35–44	21	21	18	18	22	24	27	25	27	31
45–54	27	28	25	25	29	27	35	33	31	40
55–64	33	32	31	28	30	41	45	42	39	39
65–74	36	34	31	32	29	46	50	46	32	36
75 and Over	39	28	36	35	25	*	*	*	*	*

* Experience insufficient to determine stable ratios.

Table 19. Distribution of households with relatives according to types of relatives present.[1]

WHITE, 1947

Age of Household Head	Total	Parent	Grand-child Only	Spouse of Child Only	Spouse of Child and Grand-child	Other
TOTAL	100	27	9	15	19	30
Under 25	100	63	–	–	–	37
25–34	100	59	1	–	–	40
35–44	100	54	3	7	6	30
45–54	100	24	7	19	22	28
55–64	100	10	14	20	32	24
65 and Over	100	2	18	20	25	35

NON-WHITE, 1947

Age of Household Head	Total	Parent	Grand-child Only	Spouse of Child Only	Spouse of Child and Grand-child	Other
TOTAL	100	15	25	8	13	39
Under 25	100	46	–	–	–	54
25–34	100	30	4	1	–	65
35–44	100	21	20	6	8	45
45–54	100	10	33	11	15	31
55–64	100	4	38	12	24	22
65 and Over	100	2	40	10	30	18

WHITE, 1933

Age of Household Head	Total	Parent	Grand-child Only	Spouse of Child Only	Spouse of Child and Grand-child	Other
TOTAL	100	27	10	9	16	38
Under 25	100	41	–	–	–	59
25–34	100	51	1	–	–	49
35–44	100	47	2	3	6	42
45–54	100	26	9	13	14	38
55–64	100	7	18	14	27	34
65 and Over	100	–	27	11	38	24

NON-WHITE, 1933

Age of Household Head	Total	Parent	Grand-child Only	Spouse of Child Only	Spouse of Child and Grand-child	Other
TOTAL	100	23	21	4	8	44
Under 25	100	48	–	–	–	52
25–34	100	31	4	1	1	63
35–44	100	33	14	5	6	42
45–54	100	9	34	4	16	35
55–64	100	7	46	11	19	17
65 and Over	100	–	62	8	8	22

[1] Families in this category include relatives of the following types the more frequent of which are listed first; siblings of the head or his spouse, nieces and nephews, aunts and uncles, and cousins.

It has been indicated that more than one-fifth of white and non-white households have relatives present in the household. It is of interest therefore to inquire into the nature of such persons. Unfortunately, the data do not readily permit of a complete description of this matter, but the occurrence of certain of the more frequent types is given in Table 19. (Exact relationships were not coded in 1922.) Ward 7 data is employed for 1933 and 1947 to give a general idea of changes with time.

The distributions shown for white households indicate that there is little change in the relative proportion with which given types of relatives are present in the family when the 1933 data is compared with the recent 1947 material. Parents of the head are present in 27 per cent of households which have relatives, a proportion which declines markedly with the age of the head.

In 1933, the spouse of a child of the household head was present in 25 per cent of white households with relatives present. This proportion rose to 34 per cent in 1947, an increase which is believed to be only of a temporary nature and due to the severe housing shortage which prevailed for several years following the end of World War II.

The outstanding difference between the Negro distribution of relatives and the corresponding white data, lies in the greater relative frequency of Negro children living alone with their

Table 20. Per cent of non-white households with non-related members[1] present according to age of head of household, Ward 7, Eastern Health District of Baltimore, in successive census years.

AGE OF HOUSEHOLD HEAD	1922	1933	1936	1939	1947
TOTAL	24	18	18	17	16
Under 25	27	17	9	7	10
25–34	27	19	18	14	13
35–44	23	20	20	16	15
45–54	24	15	17	21	16
55–64	14	17	21	20	19
65–74	15	9	15	13	24
75 and Over	*	*	*	*	*

* Experience insufficient to determine stable ratios.
[1] Includes households with both related and non-related persons present.

grandparents than is observed in white households. Also, the proportion of subfamily units among Negro households with relatives is smaller than the comparable figure for the white families, cited above.[6]

With respect to the presence of non-related members in the household, we have not shown figures for white units. In Table 20 relevant statistics will be found for colored units. Among white households, a constant proportion of five per cent have included non-related persons and the proportion has shown no variation either among age groups of household heads nor with the course of calendar time through the years covered by the censuses.

A somewhat different picture characterizes the Negro household. Although there is evidence of continued decline, non-related persons have constituted from 24 to 16 per cent of the total Negro households over the interval 1922–1947. Statistically significant differences are not discerned between the several age groups. Of principal significance is a decline in this proportion over the study period particularly in the age groups below 45 years.

ACKNOWLEDGMENT

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[6] Subfamily consists of a child of the head, the child's spouse with or without children (grandchildren of the head).

SOCIAL AND PSYCHOLOGICAL FACTORS AFFECTING FERTILITY

XXV. THE PREDICTION OF TOTAL FERTILITY[1]

EDGAR F. BORGATTA AND CHARLES F. WESTOFF[2]

THE Indianapolis Study of Social and Psychological Factors Affecting Fertility, initiated in 1938, is now nearing completion. Twenty-four articles reporting the results and analyses of hypotheses have already been published with with only a few still to be reported. Most of these hypotheses, however, have been directed to an analysis of factors affecting the fertility of couples who had successfully *planned* the number and spacing of their children. There is little doubt that this is the problem which is of the greatest theoretical significance and the one that is especially pertinent if we make the not unreasonable assumption that birthrates in the future will come closer and closer to being reflections of the desire and will of couples about the number of children they want. However, this trend is far from being completed. Over half of the pregnancies to couples in the Indianapolis Study, for example, were conceived while contraception was being practiced[3] and this is a sample which one might expect on the basis of its characteristics[4] would overestimate the practice of contraception in the American married population at large.

[3] *See* Westoff, Charles F., Herrera, Lee F., and Whelpton, P. K.: Social and Psychological Factors Affecting Fertility. xx. The Use, Effectiveness, and Acceptability of Methods of Fertility Control. The Milbank Memorial Fund *Quarterly,* July, 1953, xxxi, No. 3, pp. 304–305 (Reprint pp. 898–899).

[4] The sample consists of a native-white, Protestant, urban population of a predominantly "middle-class" character.

Consequently, it is still important for demographic interests
to review the data from the Indianapolis Study from the point
of view of determining the limits of our present ability to pre-
dict *total* fertility, or more specifically in this case, the distribu-
tion of live births ever born to couples married from 12 to 15
years, a fairly reliable estimate of the eventual completed size
of family. Our data relate, however, only to couples classified
as "relatively fecund"[5] and, by definition, exclude couples clas-
sified as "relatively sterile."[6] This exclusion was necessary for
various reasons but primarily because the same questions were
not asked of the couples classified as "relatively sterile." Thus,
our total fertility data in this article refer to the net result of
planned and unplanned conceptions that resulted in live births
and does not include any adjustment for sterility[7] which would
be necessary in predictions[8] of the fertility of a general popu-
lation.

As the title indicates, this article represents the first part of
this work. The second part, which will follow in a subsequent
issue, will be entitled "The Prediction of Planned Fertility"
and will treat with the same statistical procedures the data re-
lating to the size of families that were completely planned.
This second article will be of greater theoretical relevance for
the planning of new studies.

In addition to our prediction interests in these two articles,

[5] The "relatively fecund" group includes all couples reporting four or more
live births. It also includes couples with three or fewer live births unless they
knew or had good reason for believing that conception was physiologically impos-
sible during a period of at least 24 or 36 consecutive months since marriage (24
if never pregnant, 36 if ever pregnant). Failure to conceive when contraception
was not practiced "always" or "usually" during periods of the above durations was
considered good reason for such belief.

[6] Couples were so classified who did not satisfy the above criteria of the "rela-
tively fecund" classification.

[7] For estimates of the effect of sterility on the birthrate *see* Whelpton, P. K.,
and Kiser, Clyde V.: Social and Psychological Factors Affecting Fertility. VIII. The
Comparative Influence on Fertility of Contraception and Impairments of Fecun-
dity. The Milbank Memorial Fund *Quarterly*, April, 1948, xxvi, No. 2, pp. 205–
213 (Reprint pp. 326–334).

[8] Actually, when we use the term "prediction" in this study we are not referring
to an estimate of the actual birth rate (although, by implication, this is ultimately
involved) but rather an attempt to control statistically with other variables the
maximum amount of the variance of fertility that is possible.

it is important, especially since plans for follow-up studies of fertility are being made, that we re-examine the Indianapolis data with the more refined analytical techniques that have become available since the Study was initiated. Any new studies that may develop will, of course, draw generously on the experience of the Indianapolis Study.

One of the characteristic features of the progress of the Indianapolis Study has been the practice of self-examination and self-criticism that its contributors have adopted. Criticisms have revolved around such matters as the lack of theoretical organization of hypotheses, the *ex post facto* nature of the Study design, the restrictive homogeneity of the sample, the failure of the Study to indicate the "baby boom" of the 1940s, etc. Two other criticisms are particularly pertinent here: that the level of prediction of fertility has been unduly low, and that a less atomistic approach to the data would be desirable. The first criticism is debatable. On the one hand it is true that analysis of some of the data with the techniques of partial and multiple regression[9] yielded a maximum control of the variance of fertility, for example, of around only 12 per cent.[10] On the other hand, expectations that social and psychological factors would be accurate predictors of discrete sets of events such as fertility represents, which events are subject to inclination and accident, are not realistic at all. Size of family is the net result of a highly complex set of factors and, at best, the Indianapolis Study should be viewed only as a narrow intersection of some of the pertinent variables. The criticism that the data have been approached "atomistically" derives from two arguments —that the individuals and couples who were interviewed were treated more as a series of traits, characteristics, and attitudes than as whole people, and secondly, that the data were analyzed hypothesis by hypothseis with little attempt at integra-

[9] Westoff, Charles F. and Kiser, Clyde V.: Social and Psychological Factors Affecting Fertility XXI. An Empirical Re-Examination and Intercorrelation of Selected Hypothesis Factors. The Milbank Memorial Fund *Quarterly*, October, 1953, xxxi, No. 4, pp. 421–435 (Reprint pp. 953–967).

[10] Ibid. p. 434 (Reprint p. 966). This figure refers only to planned fertility.

tion. The first criticism is valid and perhaps somewhat characteristic of statistical studies in this area in general; the latter objection has been met in part by the Westoff and Kiser article and in part by this work.

This paper and the one that will follow thus constitute another exploration of the Indianapolis Study data with the objectives of: (1) achieving the maximum prediction of fertility; (2) achieving greater integration of the results; and (3) testing the sensitivity of the data to more advanced techniques of statistical analysis. Two approaches are utilized—the Guttman cumulative scaling procedure with the H-technique improvement, and the Thurstone centroid method of factor analysis.

The Data and Scaling Application

The data from the Indianapolis Study that were employed for this analysis are derived from the responses of the 860 "relatively fecund" wives[11] (the uninflated sample) to the social-psychological questions in the interview questionnaire, and information from other schedules on number of live births, fertility planning status, or the extent to which the couple effectively planned the number and spacing of births, and seven items relating to the socio-economic status of the couple. This intensive interview study was restricted to couples meeting the following eligibility requirements: husband and wife native white, both Protestant, married during 1927–1929, neither previously married, husband under 40 and wife under 30 at marriage, both completed at least the eighth grade, and residents of a large city most of the time since marriage.

The essential idea of "scaling" is quite simple. It involves an arrangement of items in the order of their "difficulty" of response. The classic example is in the measurement of the dimension of mathematical ability where three problems involving a knowledge of arithmetic, algebra, and calculus are presented. The more difficult require a knowledge of the more

[11] The analysis was restricted to wives largely for reasons of economy, in addition to the fact that previous work on the Indianapolis data did not indicate significant differences between wives and husbands in the relationships analyzed.

elementary. In the more complex field of measurement of attitudes, opinions, personality characteristics, and the like, the arrangement of items in terms of their face identification is not so simple. The problem is to achieve an ordering of items on a scale of "commitment" (substitute for "difficulty" in the illustration above), so that if we know an individual's rank on the scale we can successfully predict (say, a minimum of nine times out of ten on the average) his answers to all other items on the same scale dimension. The mathematical basis of scale theory and a general statement of procedure can be found in Vol. IV of the AMERICAN SOLDIER studies.[12] The modification of the general procedure outlined in this volume that is used in this analysis is called the H-cumulative technique. The theoretical basis of this improvement and a step-by-step illustration of the mechanical techniques involved can be found in a recent article in *The Public Opinion Quarterly*.[13] The essential innovation involved in this improvement is the development of a "contrived" item from a number of original questionnaire items.[14] Thus, instead of relying on single items for steps on the scale, clusters of items having similar response frequencies are formed. This technique has as one of its advantages the utilization of a large number of items, thus increasing confidence that the scale reflects a "real" dimension rather than the possibility, that is sometimes charged in criticisms of four- or five-item scales, that "they hold together merely because they have something highly specific . . . either in phrasing of content or in format. . . ."[15]

Briefly, the advantages of developing scales for data of this kind are: (1) That they will afford assurance that variables in which we are interested are being tapped in a reasonably

[12] *See* Stouffer, Samuel A., *et al.*: MEASUREMENT AND PREDICTION. Studies in Social Psychology in World War II, Vol. IV. Princeton, Princeton University Press, 1950. *See* especially Chap. 4.

[13] Stouffer, Samuel A.; Borgatta, Edgar F.; Hays, David G.; and Henry, Andrew F.: A Technique for Improving Cumulative Scales. *The Public Opinion Quarterly*, Summer, 1952, xiv, No. 2, pp. 273-291.

[14] Some slight modifications of the procedure of cumulative scaling that are introduced here are discussed in Appendix A.

[15] Ibid., p. 275.

stable form; (2) That considerable confidence may be attached to the unidimensionality of content among the various groups of items; and (3) That it inspires additional confidence in the face validity identification of the variables involved. If sets of questions are not purified into a single content area, or known content areas of known relationship, the sets of questions can hardly be used in a completely meaningful way, that is, they may be used for prediction but not necessarily for "understanding."[16]

In the original design of the Indianapolis Study, the individual questionnaire items were grouped for analysis under a number of specific substantive hypotheses. These items have been rearranged into new classifications for the purpose of deriving scales. The new arrangements frequently have cut across the original designations and have also left a number of items unclassified. Some of the smaller groupings of items have been omitted entirely because they did not provide a sufficient number of items for scaling. Thus, since the emphasis is on scaling, the procedure described in this paper should not be interpreted as a maximum utilization of all the available data. Only those data adaptable for scaling are incorporated. It is well to reiterate that this analysis grew out of an exercise testing the applicability of the Indianapolis data for scaling and that the data have not been re-examined for maximum prediction, except within the content of the scales.[17] In our opinion,

[16] The utilization of scaling techniques has much in common with factor analysis and actually can be conceived as a rudimentary form of factor analysis in which the analyst makes sophisticated guesses concerning the operation of certain variables (possibly coincident with factors) and screens accordingly. If large numbers of items are to be utilized, the advantage of the scaling technique in its speed of application may be of greater importance than the loss of control over some of the variance. Similarly, the method of grouping items by common sense (face validity) may enable the researcher to arrive more quickly at the required sets of variables without the severe problem of content identification sometimes accompanying factor analysis.

[17] It should be remembered, thus, that two types of data loss are built into this present analysis: (1) loss by omission of items not classifiable in terms of content; and (2) loss by omission of small sets of questions. A third type of loss is inherent in the procedure. The building of cumulative scales maximizes the common content of the questions and treats non-common content as error variance. Thus, if our present concern were one of maximum prediction we would have discarded a considerable part of our data by utilizing this technique.

however, it is highly improbable that any further manipulation of the data will result in predictions significantly higher than those resulting from this work and from the prior analysis of Westoff and Kiser.[18]

In our rearrangement of questions we established the following classifications with the following designations:

1. Stated sensitivity to inducements to having more children. Nine questions included, nine questions used in a scale.

2. Assessment of conditions during most of married life. Twelve questions included, nine questions used in a scale.

3. Liking for children. Thirteen questions included, nine questions used in a scale.

4. Felt restriction of personal freedom, non-economic. Ten questions included, nine questions used in a scale.

5. Happiness of family and childhood situations. Eight questions included, six questions used in a scale.

6. Adherence to traditions. Seventeen questions included, six questions used in a scale (6a) which relates specifically to traditional perceptions of women's behavior, and nine questions used in a scale (6b) regarding perceptions of traditional values about marriage and family.

7. Interest in religion. Nine questions included, nine questions used in a scale.

8. Feelings of personal inadequacy, self and husband. Twenty-two questions included, nine questions used in a scale (8a) with self reference, and six questions used in a scale (8b) with husband reference. (i.e., wife's perception of husband.)

9. Tendency to perceive factors as deterrents to having children. Eleven questions included, six questions used in a scale.

10. Tendency to plan in general. Seven questions included, six questions used in a scale.

11. Ego satisfaction as a motive for having children. This scale was not attempted since the complete sample would have been available on only two questions. A scale might have been available for the sample in which the majority of questions would have been pertinent, but our concern here was only with the scales pertinent to the entire sample.

[18] *Op. cit.*

12. Felt dominance of husband or wife (by wife responses). This scale was not attempted since the distribution of responses was such that scales of the cumulative type either could not be expected, or would discriminate only one or two very extreme

Table 1. The distribution of wives by scale-type classification for eight cumulative scales (H-technique) developed from three contrived item scales[1] (Table 1a) and for five cumulative scales (H-technique) developed from two contrived item scales[2] (Table 1b) (N = 860).

Table 1a

SCALE TYPE CLASSIFICATION[3]	CONTRIVED ITEM			SCALE IDENTIFICATION CODE[2]							
	1	2	3	1	2	3	4	6b	7	8a	13
1[4]	+	+	+	144	137	135	202	104	156	115	329
2	+	+	−	365	292	192	250	264	290	285	220
(2)	+	−	+	6	22	42	22	51	9	24	33
3	+	−	−	114	213	268	202	301	258	247	114
(1)	−	+	+	1	10	12	8	22	3	8	8
(3)	−	+	−	15	54	35	56	47	17	49	41
(4)	−	−	+	1	9	8	5	11	2	11	8
4	−	−	−	214	122	168	115	60	125	121	107
Number of "Errors"				23	96	97	91	131	31	92	90
Coefficient of Reproducibility				.991	.963	.962	.965	.949	.988	.964	.965

Table 1b

SCALE TYPE CLASSIFICATION[3]	CONTRIVED ITEM		SCALE IDENTIFICATION CODE[2]				
	1	2	5	6a	8b	9	10
1[4]	+	+	185	263	167	509	197
2	+	−	484	436	564	215	445
(2)	−	+	15	4	21	19	25
3	−	−	176	157	108	120	193
Number of "Errors"			15	4	21	19	25
Coefficient of Reproducibility			.991	.998	.988	.989	.986

[1] For the original questions included in the contrived items and the identification of a positive response in an original item, *see* Appendix B.   Two positive or three positive responses to the three questions of a contrived item were considered a positive response to the contrived item.

[2] *See* text for substantive identification.

[3] Non-scale response patterns are indicated by parentheses.   These were classified by minimum error or middle-class assignment, whichever applied.

[4] A classification of 1 had the following meanings: Scale (1): most sensitive to inducements to having more children; Scale (2): favorable assessment of conditions during most of married life; Scale (3): most liking for children; Scale (4): least felt restriction of freedom, non-economic; Scale (5): happy family and childhood situations; Scale (6a): most adherence to traditional belief that females should be restricted; Scale (6b): most adherence to selected traditional beliefs; Scale (7): most interested in religion; Scale (8a): least feelings of personal inadequacy of self; Scale (8b): least feelings of personal inadequacy of husband; Scale (9): tendency not to perceive factors as deterrents to having children; Scale (10): tendency not to plan in general; Scale (13): least dissatisfaction with husband.

groups. Further, preliminary screening of the items indicated negligible intercorrelations.

13. Dissatisfaction with husband. Thirteen questions included, nine questions used in a scale.

The original questionnaire items that were utilized for each of the scales that were used are reproduced (with response frequencies) in Appendix B. The distribution of wives by scale-type classification for the thirteen scales that were derived appears in Table 1.

When this analysis was first conceived, attention was focussed primarily on these attitudinal, or as they were loosely termed, the "psychological" variables. When this early work on the derivation of scales for these data had been completed and after the Westoff-Kiser analysis had been reported, it was decided to include measures of socio-economic status (SES) in this analysis. The Westoff-Kiser analysis had confirmed what had been reported previously by individuals doing research on the different hypotheses of the Indianapolis Study, that the relationships between SES and the fertility variables were the highest to be found in the data, and that what slight associations between the psychological variables and fertility behavior that were observed were consistently and substantially diminished when SES was controlled. The one chief exception to this pattern was the variable identified as "feeling of economic security" which, at the conceptual level, can be interpreted as a perceptual reflection of SES. This variable is partially represented in scale form (No. 2) in this current analysis as "assessment of conditions during most of married life."[19]

The intercorrelation of these scales and the SES items, and fertility planning and fertility are presented in Table 2. It should be reemphasized that "fertility" refers to *total* fertility here and not only to *planned* fertility as in many of the previ-

Table 2. The intercorrelations* of fertility planning, fertility, thirteen attitudinal scales, and seven socio-economic variables.

VARIABLE IDENTIFICATION CODE**

	FP	F	1	2	3	4	5	6a	6b	7	8a	8b	9	10	13	14	15	16	17	18	19	20
FP	X	.62	.01	.16	.05	.13	.07	.07	.05	.06	.20	.10	.06	.13	.11	.26	.19	.22	.28	.36	.27	.34
F		X	.06	.16	-.10	.09	.03	.10	.09	.16	.14	.00	-.04	.11	.11	.25	.17	.24	.25	.37	.23	.37
1			X	.19	-.09	.27	.13	-.08	-.15	-.04	.11	.04	.09	-.08	.09	.14	.14	.18	.11	.10	.16	.14
2				X	.04	.15	.10	.03	-.03	-.01	.33	.10	.07	.23	.14	.19	.22	.28	.39	.33	.46	.38
3					X	.20	.14	-.03	-.10	-.22	.18	.08	.37	.18	.19	.06	.05	.04	.00	.08	.03	.05
4						X	.15	-.08	.02	-.04	.25	.13	.41	.16	.24	-.02	-.01	.02	.07	.02	.01	-.01
5							X	-.07	.09	-.11	.18	.13	.15	.14	.11	.22	.14	.06	.07	.10	.11	.14
6a								X	-.16	-.07	.00	-.04	.00	-.01	.06	.09	.08	.05	.12	.15	.12	.15
6b									X	-.16	.07	-.05	-.03	.00	-.05	.25	.03	.11	.02	.12	.04	.09
7										X	-.04	-.06	-.03	-.11	-.05	.01	.03	.08	.04	.11	.06	.06
8a											X	.34	.17	.29	.34	.19	.14	.17	.15	.19	.19	.19
8b												X	-.12	.16	.20	.01	.09	.07	.04	.07	.07	.01
9													X	.10	.26	.06	.09	.07	.00	.10	.05	.02
10														X	.18	.16	.12	.14	.29	.19	.18	.22
13															X	.06	.07	.01	.11	.09	.10	.11
14																X	.45	.30	.30	.46	.37	.47
15																	X	.30	.29	.45	.44	.45
16																		X	.30	.46	.37	.45
17																			X	.51	.44	.41
18																				X	.61	.69
19																					X	.67
20																						X

* N = 669 (the highest number of known scores on all variables). These coefficients were calculated by the Pearsonian product-moment formula. A coefficient of approximately ±.12 is required for a statistically significant departure from zero at the 1 per cent level of probability and one of approximately ±.09 at the 5 per cent level according to R. A. Fisher's formula.

** Code identification; the meaning and correlated direction of the variables: (note that variables 1, 6a, 6b, 7, and 10 appear with sign meanings opposite from those in Table 1).

FP. Effective fertility planning.
F. Low Fertility.
1. Low sensitivity to inducements to have more children.
2. Favorable assessment of conditions during most of married life.
3. Most liking for children.
4. Low felt restriction of personal freedom (non-economic).
5. High assessment of childhood.
6a. Low adherence to traditional belief that females should be restricted.
6b. Low adherence to selected traditional beliefs.
7. Low interest in religion.
8a. Least feelings of personal inadequacy of self.
8b. Least feelings of personal inadequacy of husband.
9. Least perception of factors as deterrents to having children.
10. High tendency to plan in general.
13. High satisfaction with husband.
14. High education of wife.
15. High education of husband.
16. High occupational class.
17. High net worth.
18. High rating on Chapin's Social Status Scale.
19. High average annual earnings of husband.
20. High monthly rent or rental value of home at interview.

ous reports and in the second article that will follow from this work.

The predictive values of the individual scales are evident in Table 2. Aside from the *relatively* high values for the SES items, the highest predictive value observed for effective fertility planning from the scales is .16 (Scale 2: Assessment of conditions during most of married life) and for low fertility also .16 for the same scale and for interest in religion (Scale 7). On the basis of this observation which indicated that none of the scale variables were strongly related to fertility planning or fertility, the scales were dichotomized and ordered in direction of correlation to see how much they were jointly related to fertility. The score assigned to each wife was the simple sum of the one and zero values derived from the scale dichotomies. This score was correlated with fertility and the magnitude of the correlation was .32, indicating that approximately 10 per cent of the variance of fertility could be accounted for by this procedure. Actually, in terms of pure mechanical prediction, the best prediction we have of fertility in this study is obviously the extent to which fertility is planned. The correlation of these two variables is .62 (between low fertility and effective planning) indicating an approximate control of close to 38 per cent of the variance. This relationship, however, is of little significance for our theoretical concerns about the social-psychological antecedents of size of family.

THE FACTOR ANALYSIS

The method of factor analysis was chosen as the technique most useful for introducing some order into the large number of variables that were analyzed. Factor analysis, in general, facilitates consideration of the number and nature of the factors operating among a series of intercorrelated variables, their degree of interaction, and the magnitude of their influence.[20] In short, it aims at accounting for the relationships among a large group of variables (here we have 22 variables with 231

[20] Cattell, Raymond B.: FACTOR ANALYSIS: AN INTRODUCTION AND MANUAL FOR THE PSYCHOLOGIST AND SOCIAL SCIENTIST. New York, Harper and Brothers, 1952, pp. 20–21.

intercorrelations), by a smaller number of variables, or common factors. Actually, in this particular study we are primarily interested in isolating the factors associated with fertility and fertility planning, and are only secondarily interested in identifying the factors underlying the relationships of our other variables. Accordingly, our attention will be directed mainly toward the factors in which fertility and fertility planning are the most heavily loaded.

The factor analysis was done by the complete centroid

Table 3.   The rotated[1] factor matrix.

IDENTIFICA-TION CODE	VARIABLE	ROTATED FACTORS					
		I	II	III	IV	V	Commu-nality
FP.	Effective Fertility Planning	.40	−.04	.01	.61	.08	.54
F.	Low Fertility	.38	.08	−.10	.67	.00	.61
1.	Low Sensitivity to Inducements to Fertility	.18	−.21	−.34	−.06	−.07	.20
2.	Favorable Assessment of Conditions	.47	−.26	.04	−.03	−.27	.36
3.	Most Liking for Children	.06	−.40	.11	−.11	.24	.25
4.	Low Felt Restriction	−.04	−.57	−.36	.10	−.06	.47
5.	High Assessment of Childhood	.17	−.28	.00	−.05	.24	.17
6a.	Low Adherence to Tradition	.14	.10	−.21	.10	−.09	.09
6b.	Low Adherence to Tradition	.17	.04	−.28	.05	.14	.13
7.	Low Interest in Religion	.08	.22	−.26	.15	−.14	.17
8a.	Least Feeling of Personal Inadequacy (Self)	.26	−.54	.18	.19	−.07	.43
8b.	Least Feeling of Personal Inadequacy (Husband)	.07	−.36	.19	.11	−.04	.18
9.	Least Perception of Deterrents to Fertility	.06	−.51	−.29	−.05	.18	.38
10.	High Tendency to Plan in General	.28	−.35	.19	.05	−.06	.24
13.	High Satisfaction with Husband	.10	−.46	.04	.20	−.08	.27
14.	High Education of Wife	.59	−.02	−.05	.06	.36	.49
15.	High Education of Husband	.58	−.03	−.01	−.03	.19	.38
16.	High Occupational Class	.55	−.04	−.10	−.01	.02	.31
17.	High Net Worth	.67	−.04	.04	.04	−.31	.55
18.	High Rating on Chapin's Scale	.80	.02	−.06	.08	.01	.65
19.	High Average Annual Earnings of Husband	.75	−.03	.01	−.09	−.20	.62
20.	Rent at Interview	.85	.04	.02	.03	−.15	.75

[1] The factor matrix before rotation appears in Appendix C.

method as outlined by Thurstone.[21] Five factors were found, the fifth being somewhat questionable. When a strong first factor was observed to group a large number of the variables and the two variables of fertility planning and fertility were perceived to be similarly located in this factor, it was decided to rotate the remaining variance of these two variables into a single factor.[22] The factor matrix after rotation appears in Table 3 (the unrotated factor matrix is reproduced in Appendix C).

Looking first at Factor I, we observe that fertility planning and fertility have high loadings as compared to their weight in all the remaining factors with the exception of Factor IV. Looking at the loading of other variables in Factor I, we find that such variables as rent, rating on Chapin's Social Status Scale, income, net worth, education, and occupation all show high loadings, ranging from .85 to .55. The "assessment of conditions" scale (measuring lack of economic tension) and feeling of economic security also correlates well with Factor I, at the level of .47. Tendency to plan in general, and feelings of personal adequacy also show some loadings in Factor I, though to a much lesser extent. Without doubt, we can identify Factor I as the well-known "socio-economic" factor. The stylization of living which a given socio-economic position permits or encourages is probably most sensitively reflected by the type and quality of the home or apartment one lives in, a fairly reliable index of which can be derived from the rental value of the home or the actual rent paid for the apartment. Similarly, Chapin's Social Status Scale is an index of social status based on the condition and furnishings of the living room. These two variables, it will be noted, have the highest loadings in Factor I and the highest correlations with fertility planning and fertility (*see* Table 2).[23] Thus, "material style of life" might be a

[21] Thurstone, L. L.: MULTIPLE FACTOR ANALYSIS. Illinois, The University of Chicago Press, 1947.

[22] This, in fact, was one of the most likely rotations, even though it was determined primarily by these two variables.

[23] No cause-effect sequences are postulated here since it seems clear that the

more appropriate identification of Factor I than simply the "socio-economic" factor.

As was noted above, the residual variance of fertility planning and fertility was rotated into a single factor and appears in Factor IV. What this means in somewhat different terms is that the variance of fertility planning and fertility that is not accounted for by the socio-economic factor was isolated in an attempt to determine which other variables could be identified as being related to this non-socio-economic variance. Our attempt was largely unsuccessful, a conclusion which can be readily confirmed by glancing at the other factor loadings in Factor IV. This is particularly serious because effective fertility planning and low fertility exhibit their highest loadings (.61 and .67) in this factor. The fact that Factor IV is determined primarily by these two variables indicates that this factor accounts for the interrelationship of these two variables. However, since Factor IV also accounts for the remainder of the common variance of these two variables, it indicates how good other variables are as predictors of Factor IV which is defined. The only other variables that show any slight positive association with this factor are high satisfaction with spouse, high feelings of adequacy, and low interest in religion. Although we are obviously on *extremely* tenuous grounds in trying to infer the common content of this factor from these low correlations we can suggest very tentatively that the factor may be the "successful-rational-modern family" dimension. The theoretical speculations about the declining birthrate in Western civilization have included this particular factor in terms of the small-family type emerging in an urban, mobility-oriented culture which stressed modern, rational companionate marriage. With respect to these data, however, we cannot emphasize too strongly that this is at best an extremely tentative suggestion about the meaning of Factor IV. It must be stressed that the variables that show these slight relationships with Factor IV

condition of one's living room, for example (involved in Chapin's Social Status Scale) can be related to fertility in both directions.

only contribute about 1 to 2 per cent control of the variance of this factor and it is evident that they exhibit considerably heavier loadings in Factor II which does not include significant loadings of fertility planning and fertility. The net conclusion we can draw from these observations is that a good test of Factor IV is simply not available in these data. This conclusion has significant implications for the planning of new research in this field.

As was noted earlier, we are not primarily concerned here with the identification of the factors accounting for the common variance of the intercorrelations among the variables outside of fertility planning and fertility, except as they might serve to purify tests of Factors I and IV in which these two variables are loaded. The variables that appear to be significant and operating jointly in Factor II are feelings of inadequacy, high felt restriction on pleasure as a result of children, high perception of deterrents to having more children, dissatisfaction with spouse, dislike of children, and a tendency not to plan in general.[24] These variables all show loadings of over .35 and extend to .57. We can generalize that the common factor in these relationships may be a "personal-family adjustment" dimension.

Factor III does not contain any particularly high loadings of any of the variables included in the analysis. The variables that do manifest some association are high-felt restriction due to children, a high sensitivity to (economic) inducements to having more children, a high adherence to traditions, a high interest in religion, feelings of personal adequacy, a tendency to plan in general, and a liking for children. Although the meaning of this factor is by no means clear, it may suggest the presence of a "conformity-tradition" factor.

The last factor, Factor V, is not clearly defined at all, and

[24] Throughout this discussion we have usually been describing our statistical results in terms of one end of the scale, e.g., in this specific context we mention *dis*like of children instead of a scale on "liking for children." This is simply an attempt to make the discussion as concrete as possible and is completely arbitrary. We could just as correctly refer to liking for children.

we will not venture an interpretation of it. However, it does possess some interesting properties. The outstanding feature of this factor is the positive loadings on education (.36 and .19 for education of wife and husband respectively) and the negative loadings on three of the other socio-economic variables, namely, net worth (– .31), income (– .20), and rent (– .15) and on the "assessment of (economic) conditions" (– .27). It also evidences small positive relationships with liking for children (.24) and favorable assessment of childhood situations (.24).

Conclusions

Returning to our primary interest in this first article—the prediction of total fertility and fertility planning—we note from Table 3 that the communality (h^2) of these two variables is .61 for fertility and .54 for fertility planning. This means that our five factors account for 61 and 54 per cent respectively of the total variance of these two variables. However, we observed that the highest loading of these two variables occurs in Factor IV, which accounts for 45 and 37 per cent of the total fertility and fertility planning variance itself. These data, we noted, contain no good test of Factor IV since our other variables contribute little or no association with this factor. Thus, we arrive at the conclusion that although the Indianapolis data permit a control of the variance of fertility of 61 per cent, roughly two-thirds of this control is located in the variance of fertility planning (and vice versa).[25] The other one-third of the controlled variance is located in Factor I, which is due to the socio-economic variables. Consequently, we conclude that the best prediction in the Indianapolis Study of fertility and fertility planning from variables other than themselves will be a prediction from the socio-economic variables of approximately 14 to 16 per cent of the variance (the squares of their

[25] The question of *post factum* rationalization is pertinent here and may account for some of the interrelation of the two variables. There is probably a tendency for couples to report that a child was wanted after conception occurred. In addition, there is some slight lack of independence between fertility and fertility-planning status in terms of the criteria and definition of the latter concept, but this is not a serious problem.

loadings in Factor I). This is virtually the same conclusion reached by Westoff and Kiser in their previous analysis[26] of fertility planning and *planned* fertility.

SUMMARY

This is the first of two articles on the prediction of fertility. This first paper has analyzed the Indianapolis Study data for its capacity to predict total fertility; the next paper will treat the prediction of planned fertility. This study originated in a desire by people connected with the Indianapolis Study to re-submit the data of the Study to an analysis which would utilize some of the advanced statistical techniques which have been developed since the Study was done and, with the advantages of the hindsight afforded by the individual hypothesis reports, to attempt to integrate the diverse findings into a single meaningful whole.

Two basic approaches to the data were utilized. The Guttman cumulative scaling procedure (with the H-technique improvement) was relied on to develop scales from the attitudinal data. Thirteen scales were derived. Factor analysis was then employed in an attempt to differentiate and define the factors present in the interrelation of these scales and the socioeconomic variables with fertility and fertility planning.

Five factors were found after rotation, only two of which are especially significant for fertility. The first factor (Factor I) was clearly the "material style of life" or "socio-economic" factor. The other factor (Factor IV) which included the larger proportion of the controlled variance of fertility was not at all well defined. The high loading of fertility that was observed in this factor is due mainly to a similar loading of fertility planning. In strictly predictive terms this just reiterates existing knowledge to the effect that if one knows the contraceptive and fertility-planning habits of a population one can predict a significant proportion (over 36 per cent in this Study) of the variation in the actual fertility of that population. If one has

[26] *Op. cit.*

information on both socio-economic status and fertility-planning status, that prediction can be increased to 59 per cent of the variance of fertility. There were some other very low loadings in Factor IV of a meaningful group of other variables which tempted us to suggest an identification of this factor as the "successful-rational-modern family" dimension.

<div align="center">Appendix A</div>

Several minor modifications of the H-cumulative scaling technique have been introduced in this work and should be noted. First, the preliminary item analysis utilized in the screening of questions for selection for the cumulative scales was abbreviated. Items were arbitrarily dichotomized (at the median where possible) and, on the expected order of correlation, a provisional scale score was given.

A second modification introduced in this scaling procedure is the acceptance of only odd numbers of items (three in particular) in the building of contrived items. Thus, even though the correlation of an item on the provisional scale was low and two other items exhibited high correlations with the provisional scale, the contrived item would be built with the three items rather than the two. The logical justification for this is somewhat complex but essentially involves the notion that a zero correlation item does not reduce the discriminatory capacity of the contrived item in this dimension but allows a more convenient allocation of the pattern of the responses to the original questions in the contrived item. In all cases here, a contrived item called positive is positive in a minimum of two of the original three questions utilized to define the contrived item. The description "positive," of course, refers only to the direction of the responses, which is completely arbitrary in any given set of scale computations.

A third modification in this treatment is the acceptance of scales (two-item scales) for which a latent structure[27] cannot be computed. The smallest number of items for which a latent structure may be estimated (except for the special case of a one-parameter scale) is three (utilizing a two-parameter model). However, it is possible to examine the distribution of scale types observed in the two-item case against the random distribution which may be gen-

[27] *See* Chapter 4 of Measurement and Prediction, *op. cit.*

erated from the positive frequency of the two items. Further, if necessary, a factor analysis of the six original questions (comprising the two contrived items) could demonstrate the presence of a common factor. If this common factor is significantly located in the two original questions in each of the two contrived items, it can be demonstrated that the effect of computing an H-technique scale is to emphasize the common factor and to treat the non-common factors as error variance. If, however, the intercorrelations of the items were reasonable to start, it would be expected that the common factor would be present in all six original questions, and the minimum demonstration of content homogeneity in the two-item H-technique scale would be relatively simple. Once a scale was computed, the assignment of scale types was according to the procedure discussed in a recent article.[28]

Appendix B

The following list contains the specific items that were included in each of the scales derived. Next to each response category will be found the percentage of wives giving that response (occasionally the rounded percentages do not total 100 exactly). The brackets and signs indicate the cutting points and the assignment of positive and negative responses. The number in parenthesis at the right of each item indicates the contrived item in which each was included.[29]

Scale 1. Stated sensitivity to inducements to having more children.

Most people think that families might have been larger in recent years if living conditions, wage scales, and other matters had been different.
How much would you have been encouraged to have more children if the following things had been true during your married life? In answering each part of this question pay no attention to how you answer the other parts.

[28] Borgatta, Edgar F. and Hays, David G.: Some Limitations on the Arbitrary Classification of Non-Scale Response Patterns in a Guttman Scale. *The Public Opinion Quarterly*, Fall, 1952, xvi, No. 3.

[29] The questions utilized in the original Indianapolis Study questionnaires had two forms; one designed for couples with children and the other for childless couples. Here we have combined all respondents and ignored the differences in wording which are presumably insignificant.

There is a small amount of duplication of questions in a few of the scales. This has no serious theoretical or statistical consequences.

If you could rent a larger house at no additional cost as the size of your family increased.

Per Cent

+ {
15 Encouraged Very Much
10 Much
27 Some   (2)

– *12* Little
36 Very Little

If fathers were given extra pay for each child in their family, beginning with $15 more a month for one child and rising $100 more a month for five children.

Per Cent

+ {
26 Encouraged Very Much
14 Much
26 Some   (2)

– *10* Little
24 Very Little

If it would be just as cheap for children to go to high school and college as to grade school.

Per Cent

+ {
36 Encouraged Very Much
15 Much
20 Some   (1)

– *8* Little
20 Very Little

If your doctor and dentist could give children adequate care at 25¢ per week per family.

Per Cent

+ {
32 Encouraged Very Much
14 Much
19 Some   (1)

– *10* Little
23 Very Little

If there were visiting nurses from the schools who would take care of your children when they were sick in bed.

Per Cent

+ {
20 Encouraged Very Much
10 Much
23 Some   (2)

– *13* Little
33 Very Little

If there were nurseries organized by the schools where mothers could leave their children when they wanted to go out during the day.

Per Cent

+ {
17 Encouraged Very Much
8 Much

– *25* Some   (3)
13 Little
37 Very Little

If mothers were paid a wage for rearing children, beginning with $15 a month for one child and rising to $100 a month for five children.

Per Cent

+ {
16 Encouraged Very Much
9 Much

– *22* Some   (3)
13 Little
41 Very Little

Every couple has reasons for not having more children. The following are some reasons which are given frequently.

How much has each of these reasons discouraged you and your husband from having more children?

The cost of having and raising children.

Not being sure of having a steady income.

Per Cent

- *32* Discouraged Very Much
  25 Much
  26 Some   (3)
+ { *9* Little
  { *7* Very Little or Not at All

Per Cent

- *14* Discouraged Very Much
  9 Much
+ { *24* Some   (1)
  { *16* Little
  { *36* Very Little or Not at All

SCALE 2. Assessment of conditions during most of married life.

Think back over the twelve to fifteen years that you have been married. Then answer the parts of this question so that they will show how things have been DURING MOST OF YOUR MARRIED LIFE.

Have you had as much to spend as most of your friends?

How much more income would you have needed in order to live in a way that would have been satisfactory to you?

Per Cent

- *8* We Have Had Much Less
  32 Somewhat Less
+ { *46* Same   (2)
  { *13* Somewhat More
  { *0* Much More

Per Cent

- *8* Very Much
  24 Much
  44 Some   (3)
+ { *14* Little
  { *9* Very Little

How much financial help could you expect from relatives in case of an emergency in your family?

How much of the time have you been faced with the possibility that your husband might have a large pay cut or be out of a job for several months?

Per Cent

- *15* Definitely None
  22 Probably None
  33 Little   (3)
+ { *27* Fair Amount
  { *3* Large Amount

Per Cent

- *2* Nearly All of the Time
  10 Much of the Time
  32 Some of the Time   (2)
+ { *23* Seldom
  { *32* Very Seldom

Have you felt satisfied with most of the houses in which you have lived?

Per Cent

-   5 Very Dissatisfied
  15 Somewhat Dissatisfied
   7 Neither Satisfied nor Dissatisfied   (1)
+ {53 Fairly Satisfied
  {20 Very Satisfied

Have your living conditions been better or poorer than those of your parents while you were growing up (6–16 years old)?

Per Cent

-   1 Ours Have Been Much Poorer
  10 Somewhat Poorer
  18 Same   (3)
  42 Somewhat Better
+ {28 Much Better

How sure do you feel that you will be able to meet family expenses during the next five years?

Per Cent

-   2 Very Doubtful
   7 Rather Doubtful
  34 Undecided   (2)
+ {53 Reasonably Sure
 { 3 Very Sure

SCALE 3. Liking for children.

Do you like to play with, read, or talk to children?

Has the family income been so small that you have had to deny yourself many things you wanted?

Per Cent

- 14 A Great Many Things
  14 Many
 {36 Some   (1)
+ {20 Few
 {14 Very Few

How interested have you been in having a car (or a better car)?

Per Cent

 {22 Very Little
+ {18 Little
 {33 Some   (1)
- 14 Much
  13 Very Much

How does the fun you get compare with the trouble when children of your neighbors or friends come in and make themselves at home?

Per Cent
- 2 Very Little
  3 Little
  29 Some (2)
+ {23 Much
  {43 Very Much

Per Cent
- 4 Much More Trouble than Fun
  8 Some More Trouble than Fun
  31 As Much Trouble as Fun (3)
  36 Some More Fun than Trouble
+ {19 Much More Fun than Trouble

Do you get tired of hearing the constant questions children ask?

Frequently children get so wrapped up in their play that they forget there is anyone around. Do you find it fun just to watch them then and see what they do and say?

Per Cent
- 1 Very Tired
  13 Rather Tired
  6 Indifferent (3)
  49 Rather Interested
+ {31 Very Interested

Per Cent
- 1 Very Little Fun
  1 Little
  7 Some (1)
  13 Much
+ {78 Very Much

Do you get as much "kick" from the things children say as from those grownups say?

How much are you interested in hearing other people talk about their children?

Per Cent
- 1 Much Less from Children
  1 Less
  10 Neither More nor Less (2)
  48 More
+ {40 Much More

Per Cent
- 4 Very Little
  6 Little
  32 Some (3)
  27 Much
+ {31 Very Much

How do you feel about seeing children's pictures in ads, store windows, etc.?

Per Cent
- 0 Annoyed or Bored
  3 Not Interested
  11 Slightly Interested (2)
  30 Rather Like
+ {55 Like Very Much

Couples have various reasons for wanting each of their children. The reasons mentioned most frequently are given below.

How much did each of these reasons encourage you and your husband to have your last child?

A strong liking for children.

Per Cent

```
-   9 Encouraged Very Little
    6 Little
    19 Some                    (1)
+ {21 Much
  {38 Very Much
```

Every couple has reasons for not having more children. The following are some reasons which are given frequently.

How much has each of these reasons discouraged you and your husband from having more children?

Not being more interested in children.

Per Cent

```
-   1 Discouraged Very Much
    2 Much
    11 Some                    (1)
    20 Little
+ {65 Very Little or Not at All
```

SCALE 4. Felt restriction of personal freedom, non-economic.

Since your first child was born, how much *more time* would you have *liked to have* for:

Going to movies?

Per Cent

```
-   2 Very Much More Time
    3 Much
    24 Some                    (1)
+ {25 Little
  {46 Very Little
```

Taking trips to visit friends, relatives, and interesting places?

Entertaining friends?

Per Cent

```
-   5 Very Much More Time
    9 Much
    36 Some                    (3)
    21 Little
+ {29 Very Little
```

Reading, resting, radio-listening, etc.?

Per Cent

- 7 Very Much More Time
  9 Much
  31 Some   (3)
  22 Little
+ {31 Very Little

Per Cent

- 12 Very Much More Time
  12 Much
+ {34 Some   (1)
  {18 Little
  {23 Very Little

Going to clubs, lodges, meetings, dances, parties, etc.?

How much has it bothered you to be tied down by your children?

Per Cent

- 1 Very Much More Time
  3 Much
  18 Some   (2)
  21 Little
+ {56 Very Little

Per Cent

- 1 Very Much
  2 Much
  16 Some   (2)
  21 Little
+ {60 Very Little

Most people think that families might have been larger in recent years if living conditions, wage scales, and other matters had been different.

How much would you have been encouraged to have more children if the following things had been true during your married life? In answering each part of this question pay no attention to how you answer the other parts.

If there were nurseries organized by the schools where mothers could leave their children when they wanted to go out during the day.

If there were visiting nurses from the schools who would help take care of your children when they were sick in bed.

Per Cent

- 17 Encouraged Very Much
  8 Much
+ {25 Some   (1)
  {13 Little
  {37 Very Little

Per Cent

- 20 Encouraged Very Much
  10 Much
  23 Some   (3)
  13 Little
+ {33 Very Little

Every couple has reasons for not having more children. The following are some of the reasons which are given frequently.

How much has each of these reasons discouraged you and your husband from having more children?

Not wanting to be tied down more by children.

Per Cent

-   2 Discouraged Very Much
    4 Much
  18 Some   (2)
  19 Little
+ {56 Very Little or Not at All

Scale 5. Happiness of family and childhood situations.

How happy was your child-
hood on the whole?

Per Cent

-   4 Very Unhappy
    4 Unhappy
  15 Neither Happy nor
      Unhappy   (2)
  55 Happy
+ {23 Very Happy

How happy were your parents in
their family life?

Per Cent

-   3 Very Unhappy
    7 Unhappy
  19 Neither Happy nor Un-
      happy   (1)
+ {51 Happy
  {19 Very Happy

How did the living conditions
of your parents compare with
those of your neighbors while
you were growing up (6–16
years old)?

Per Cent

-   1 Much Poorer than the
      Neighbors
    6 Poorer
  76 About the Same   (2)
+ {14 Better
  { 3 Much Better

Do you think the number of
children your parents had was
much of a financial hardship
for them?

Per Cent

-   10 Very Much
    7 Much
  39 Some   (2)
+ {19 Little
  {25 Very Little

Aside from money worries did
your parents have much trou-
ble in bringing up their chil-
dren, for example, health, chil-
dren getting into difficulties,
etc.?

Per Cent

-   1 Very Much
    2 Much
  11 Some   (1)
  17 Little
+ {68 Very Little

Every couple has reasons for not having more children. The following are some reasons which are given frequently. How much has each of these discouraged you and your husband from having more children?

The hard time your parents had raising children.

Per Cent
-   *5* Discouraged Very Much
    3 Much
    16 Some   (1)
+ {*19* Little
   {*57* Very Little or Not at All

SCALE 6a. Adherence to traditions.

Is it worse for a woman to do certain things than for a man? For instance:

Lie?

Per Cent
- *71* No Worse for a Woman
+ {*17* Somewhat Worse   (2)
  {*12* Much Worse

Drink?

Per Cent
- *21* No Worse for a Woman
+ {*25* Somewhat Worse   (1)
  {*54* Much Worse

Swear?

Per Cent
- *18* No Worse for a Woman
+ {*25* Somewhat Worse   (1)
  {*56* Much Worse

Carry on With the Other Sex?

Per Cent
- *35* No Worse for a Woman
   16 Somewhat Worse   (2)
+ {*48* Much Worse

Smoke on the Street?

Per Cent
- *12* No Worse for a Woman
   21 Somewhat Worse   (1)
+ {*67* Much Worse

Do you approve of a married woman with children holding a paid job outside the home if satisfactory arrangements can be made for the care of the children?

Per Cent
- *5* Strongly Approve
  21 Rather Approve
  14 Doubtful   (2)
  32 Rather Disapprove
+ {*28* Strongly Disapprove

SCALE 6b. Adherence to traditions.

Do you believe boys should be given more freedom than girls?

Per Cent

- 29 Definitely No
+ { 18 Probably No.
  18 Doubtful   (1)
  31 Probably Yes
  4 Definitely Yes

Do parents have the right to expect that their children will appreciate the sacrifices parents make for them?

Per Cent

+ { 22 Definitely Yes
  { 28 Probably Yes
- 13 Doubtful   (2)
  18 Probably No
  19 Definitely No

Do you think men should have the main say about important matters?

Per Cent

+ { 14 Definitely Yes
  { 38 Probably Yes
- 28 Doubtful   (2)
  11 Probably No
  9 Definitely No

If there are *no children* in a family, how easy should it be to get a divorce?

Per Cent

- 14 Very Easy
  15 Fairly Easy
+ { 39 Not Too Easy but Not
       Too Hard
  19 Fairly Hard   (1)
  13 Very Hard

How much do you think having children helps to keep a marriage from breaking up?

Per Cent

+ { 64 Very Much
  { 18 Much
- 13 Some   (1)
  2 Little
  3 Very Little

If it is all right to do something on weekdays, is it all right to do it on Sundays?

Per Cent

- 18 Definitely Yes
  33 Probably Yes
+ { 19 Doubtful   (2)
  { 18 Probably No
  { 13 Definitely No

Couples have various reasons for wanting each of their children. The reasons mentioned most frequently are given below.

How much did each of these reasons encourage you and your husband to have your last child?

A belief that it is a religious duty to have a family.

A feeling in your or your husband's family that it is important to carry on the family name or stock.

Per Cent

- *49* Encouraged Very Little
  16 Little
+ { *15* Some   (3)
    5 Much
    8 Very Much

Per Cent

- *52* Encouraged Very Little
  16 Little
+ { *15* Some   (3)
    3 Much
    6 Very Much

The traditional belief that married couples ought to have children.

Per Cent

- *27* Encouraged Very Little
  12 Little
  22 Some   (3)
  10 Much
+ {*22* Very Much

SCALE 7. Interest in religion.

How much have you been interested in religion:

Since marriage?

When you were 10 to 15 years old?

Per Cent

- *10* Very Little
  10 Little
  42 Some   (3)
  19 Much
+ {*19* Very Much

Per Cent

- *4* Very Little
  6 Little
  35 Some   (3)
  27 Much
+ {*27* Very Much

Some people are greatly interested in religion or church activities, others have little interest in these matters. In each case the following beliefs are often mentioned.

How important is each of these beliefs in accounting for your interest in religion or church activities? Even though your interest is slight, one or more of these beliefs may be of much importance in giving you some interest rather than one at all.

Churches provide social life.

Religion brings fellowship with God.

Per Cent

- *12* No Importance
  14 Little Importance
+ {*38* Some Importance (2)
  18 Much Importance
  17 Great Importance

Per Cent

- *2* No Importance
  2 Little Importance
+ {*12* Some Importance (2)
  25 Much Importance
  59 Great Importance

Churches are the center of useful activities.

Per Cent

-    4 No Importance
     8 Little Importance
    34 Some Importance   (3)
    29 Much Importance
+ {24 Great Importance

Religion helps one lead a better life day by day.

Per Cent

-    1 No Importance
     3 Little Importance
    14 Some Importance   (1)
+ {26 Much Importance
   {56 Great Importance

Religion prepares one for eternal life.

Per Cent

-    3 No Importance
     4 Little Importance
   {13 Some Importance   (1)
+ {18 Much Importance
   {62 Great Importance

Religion helps build a better world.

Per Cent

-    1 No Importance
     1 Little Importance
     7 Some Importance   (1)
    15 Much Importance
+ {76 Great Importance

How often did you attend church or Sunday school when you were 10 to 15 years old?
Per Cent
-    1 Very Seldom
     1 Seldom
     8 Sometimes   (2)
    24 Often
+ {65 Regularly

SCALE 8a. Feeling of personal inadequacy of self.

Think back over the twelve to fifteen years that you have been married. Then answer the parts of this question so that they will show how things have been DURING MOST OF YOUR MARRIED LIFE.

How often has everything seemed to go wrong without any reason at all?

Per Cent

-    6 Very Often
    11 Often
    39 Sometimes   (2)
+ {25 Seldom
   {19 Very Seldom

Do you get upset easily?

Per Cent

-    9 Very Easily
    22 Easily
   {47 Ordinarily   (1)
+ {18 Quite Calm
   { 3 Very Calm

On the whole have you had your share of good breaks?

Per Cent

- − 3 Definitely No
    6 Probably No
    14 Doubtful   (1)
- + {58 Probably Yes
    {19 Definitely Yes

How often is it difficult for you to make up your mind about the things that have to be done day by day?

Per Cent

- − 3 Very Often
    6 Often
    30 Sometimes   (2)
- + {31 Seldom
    {30 Very Seldom

Do you usually feel cheerful and look on the bright side of things?

Per Cent

- + { 4 Extremely Cheerful
    {15 Very Cheerful
- − 34 Rather Cheerful
    42 Ordinary   (3)
    4 Rather "Blue"
    0 Very "Blue" }
    Extremely "Blue"}

How much confidence do you have in yourself?

Per Cent

- − 3 Very Little}
    Little }
    8 Somewhat Less than Average
    61 About Average   (3)
- + {10 Somewhat More than Average
    {10 Much
    { 9 Very Much

How much energy and pep do you ordinarily have?

Per Cent

- − 6 Very Little}
    Little }
    8 Somewhat Less than Average
    52 About Average   (3)
    15 Somewhat More than Average
- + {10 Much
    { 9 Very Much

How much are you inclined to worry?

Per Cent

- − 13 Very Much
    9 Much
    {15 Somewhat More than Average
    {36 About Average   (1)
- + { 9 Somewhat Less than Average
    {12 Little
    { 6 Very Little

On the whole, how good a chance do you have to express yourself and show what you are worth either in your home-making or in your outside interests?

Per Cent

```
-    1 Very Poor Chance
     3 Poor Chance
    43 Fair Chance           (2)
+ {38 Good Chance
  {14 Excellent Chance
```

Scale 8b. Perception of husband's feeling of personal inadequacy.

How often is it difficult for your husband to make up his mind about the things that have to be done day by day?

Per Cent

```
-    1 Very Often
     4 Often
    20 Sometimes             (1)
+ {35 Seldom
  {39 Very Seldom
```

How much confidence does your husband have in himself?

Per Cent

```
-    2 Very Little}
       Little     }
     4 Somewhat Less and Av-
         age
    50 About Average         (2)
    14 Somewhat More than
         Average
+ {16 Much
  {14 Very Much
```

Does your husband usually feel cheerful and look on the bright side of things?

Per Cent

```
+ { 5 Extremely Cheerful
  {17 Very Cheerful
-  34 Rather Cheerful
   36 Ordinary              (2)
    6 Rather "Blue"
    1 Very "Blue"      }
      Extremely "Blue" }
```

How much energy and pep does your husband ordinarily have?

Per Cent

```
-    2 Very Little}
       Little     }
     5 Somewhat Less than Av-
         erage
    54 About Average         (2)
    17 Somewhat More than
         Average
+ {12 Much
  {10 Very Much
```

Does your husband get upset easily?

Per Cent

- 6 Very Easily
 12 Easily
 ⌈34 Ordinary   (1)
+ ⦃31 Quite Calm
 ⌊17 Very Calm

How much is your husband inclined to worry?

Per Cent

- 5 Very Much
 4 Much
 11 Somewhat More than
   Average
 ⌈41 About Average (1)
 �11 Somewhat Less than
+ ⦃   Average
 �16 Little
 ⌊11 Very Little

SCALE 9. Tendency to perceive factors as deterrents to having children.

Every couple has reasons for not having more children. The following are some reasons which are given frequently. How much has each of these discouraged you and your husband from having more children?

Not being more interested in children.

Per Cent

- 1 Discouraged Very Much
 2 Much
 11 Some   (2)
 20 Little
+ {65 Very Little or Not at All

The hard time your parents had raising children.

Per Cent

- 5 Discouraged Very Much
 3 Much
 16 Some   (2)
 19 Little
+ {57 Very Little or Not at All

People in "our crowd" don't have more children.

Per Cent

- 1 Discouraged Very Much
 1 Much
 · 6 Some   (1)
 13 Little
+ {79 Very Little or Not at All

Not wanting to be tied down more by children.

Per Cent

- 2 Discouraged Very Much
 4 Much
 18 Some   (2)
 19 Little
+ {56 Very Little or Not at All

A feeling that children cause husband and wife to lose interest in each other.

The poor health or physical condition of your husband.

Per Cent

-   *1* Discouraged Very Much
    1 Much
    4 Some   (1)
    8 Little
+ {*86* Very Little or Not at All

Per Cent

-   *4* Discouraged Very Much
    2 Much
    6 Some   (1)
  15 Little
+ {*74* Very Little or Not at All

SCALE 10. Tendency to plan in general.

Think back over the twelve to fifteen years that you have been married. Then answer the parts of this question so that they will show how things have been DURING MOST OF YOUR MARRIED LIFE.

When your husband has worked steadily, how often have you run out of money between pay checks?

Do you plan things in advance or wait until the time comes?

Per Cent

    { *7* Very Often
    │ *12* Often
+ { *32* Sometimes   (1)
    { *22* Seldom
- *26* Very Seldom

Per Cent

+ { *3* Almost Always Wait
   { *13* Usually Wait (2)
- *28* Plan as Often as Wait
  42 Usually Plan
  14 Almost Always Plan

Do you try to keep extra things on hand for emergencies, like a little cash, canned goods, first aid supplies, etc.?

Are you a good manager?

Per Cent

    { *1* Definitely No
    { *2* Probably No
+ { *4* Doubtful   (2)
    { *35* Probably Yes
- *59* Definitely Yes

Per Cent

    { *1* Very Poor}
    {   Poor   }
+ { *2* Somewhat Poorer than
    {   Average
    { *58* About Average   (1)
- *28* Good
    8 Very Good
    2 Excellent

Do you plan your buying for the family to take advantage of sale prices?

Many Americans buy household goods on the monthly (or weekly) payment plan. What part of yours have you bought that way?

Per Cent

- $\begin{cases} 2 \text{ Very Seldom} \\ 3 \text{ Seldom} \\ 28 \text{ Sometimes} \end{cases}$ (2)
- $\begin{cases} + \end{cases}$

- +$\begin{cases} 2 \text{ Very Seldom} \\ 3 \text{ Seldom} \\ 28 \text{ Sometimes} \end{cases}$ (2)
  34 Often
- − 33 Very Often

Per Cent

- +$\begin{cases} 9 \text{ All of Them} \\ 36 \text{ Most of Them} \\ 27 \text{ Some} \end{cases}$ (1)
- − 19 Few
  8 None

SCALE 13. Dissatisfaction with husband.

Everyone knows that even happily married couples often disagree about some things.

How much do you and your husband disagree about:

Handling family finances?

Per Cent

- − 2 Disagree Very Much
  2 Much
  16 Some   (2)
  16 Little
- +$\begin{cases} 63 \text{ Very Little} \end{cases}$

Things that a man should do around the home?

Per Cent

- − 2 Disagree Very Much
  3 Much
  21 Some   (3)
  19 Little
- +$\begin{cases} 56 \text{ Very Little} \end{cases}$

Sexual relations?

Per Cent

- − 1 Disagree Very Much
  1 Much
  12 Some   (2)
  17 Little
- +$\begin{cases} 69 \text{ Very Little} \end{cases}$

Everything considered how happy has your marriage been?

Per Cent

- − 5 Extremely Unhappy $\Big]$
  Decidedly Less Happy
    than Average
  Somewhat Less Happy
    than Average $\Big]$
  28 About Average   (3)
  18 Somewhat More Happy
    than Average
  21 Decidedly More Happy
    than Average
- +$\begin{cases} 29 \text{ Extremely Happy} \end{cases}$

Few women are completely satisfied with themselves or their husbands.

If you could make your husband over, how much would you want to change him in the following ways:

Make him more affectionate?   Make him less selfish?

Per Cent

- 2 Want Very Much
  4 Much
  21 Some   (3)
  20 Little
+ {52 Very Little

Make him more considerate in sex relations?

Per Cent

- 2 Want Very Much
  2 Much
  11 Some   (1)
  13 Little
+ {72 Very Little

Per Cent

- 3 Want Very Much
  3 Much
  17 Some   (1)
+ {13 Little
  {64 Very Little

Make him less fault-finding?

Per Cent

- 3 Want Very Much
  5 Much
  15 Some   (2)
  14 Little
+ {63 Very Little

Make him more truthful?

Per Cent

- 3 Want Very Much
  2 Much
  5 Some   (1)
  9 Little
+ {81 Very Little

Appendix C.   The factor matrix before rotation.[1]

IDENTIFICA-TION CODE	VARIABLE	FACTORS					
		I	II	III	IV	V	Commu-nality
FP.	Effective Fertility Planning	.50	.20	−.27	.39	.16	.54
F.	Low Fertility	.46	.31	−.39	.33	.22	.61
1.	Low Sensitivity to Induce-ments to Fertility	.28	−.10	−.16	−.28	−.10	.20
2.	Favorable Assessment of Conditions	.50	−.06	.17	−.18	.21	.36
3.	Most Liking for Children	.17	−.36	.16	.12	−.21	.25
4.	Low Felt Restriction	.31	−.48	−.33	−.17	−.04	.47
5.	High Assessment of Child-hood	.25	−.19	.08	.09	−.23	.17
6a.	Low Adherence to Tradi-tion	.13	.17	−.17	−.12	.03	.09
6b.	Low Adherence to Tradi-tion	.18	.12	−.18	−.07	−.20	.13
7.	Low Interest in Religion	.04	.27	−.25	−.14	.07	.17
8a.	Least Feeling of Personal Inadequacy (Self)	.47	−.38	.08	.17	.19	.43
8b.	Least Feeling of Personal Inadequacy (Husband)	.22	−.29	.08	.15	.14	.18
9.	Least Perception of Deter-rents to Fertility	.30	−.42	−.17	−.10	−.27	.38
10.	High Tendency to Plan in General	.37	−.21	.18	.09	.13	.24
13.	High Satisfaction with Husband	.32	−.36	−.08	.09	.16	.27
14.	High Education of Wife	.54	.23	.11	.16	−.33	.49
15.	High Education of Husband	.51	.21	.18	.04	−.20	.38
16.	High Occupational Class	.50	.19	.10	−.09	−.09	.31
17.	High Net Worth	.60	.23	.20	−.17	.26	.55
18.	High Rating on Chapin's Scale	.71	.35	.14	−.04	−.03	.65
19.	High Average Annual Earnings of Husband	.64	.26	.29	−.21	.10	.62
20.	Rent at Interview	.73	.38	.25	−.12	.10	.75

[1] The rotated factor matrix appears in Table 3.

ANNOTATIONS

BARCLAY'S TWO REPORTS ON TAIWAN[1]

THE book COLONIAL DEVELOPMENT AND POPULATION IN TAIWAN is devoted to an analysis of demographic changes in Taiwan prior to World War II, with particular attention to the 1920–1930 decade. The major interest of this analysis is not so much in the growth and development of the population of Taiwan itself as in the fact that "Taiwan is the only place where it is possible to study the processes of change of a Chinese population over a substantial period of time on the basis of excellent data. Any information that can be gained about the growth characteristics of one of the world's largest ethnic groups is well worth obtaining. . . . Here is an opportunity to study the impact of an aggressive program of agricultural development on population growth. . . ." The materials are organized as follows: First, a chapter which summarizes population growth in Taiwan; second, three chapters concerning economic activities, including the number and characteristics of the economically active population; third, a chapter about migration and growth of cities; fourth, one chapter devoted to mortality, and three chapters relating to fertility and factors affecting it; and then a short summary chapter.

The sections on economic activity point out that the Taiwanese produced a surplus of agricultural products during the years of Japanese administration. This was accomplished without mechanization of farms, and without appreciably disturbing traditional modes of life in rural Taiwan. The other note-

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[1] Barclay, George W.: COLONIAL DEVELOPMENT AND POPULATION IN TAIWAN. Princeton, Princeton University Press, 1954, xviii + 274 pp., $5.00.

Barclay, George W.: A REPORT ON TAIWAN'S POPULATION TO THE JOINT COMMISSION ON RURAL RECONSTRUCTION. Office of Population Research, Princeton University, 1954, xii + 120 pp., $2.50.

worthy achievement of the Japanese was the reduction of mortality from a crude death rate of about 35 per thousand population shortly after the turn of the century to less than 20 in the early forties. "Since nothing occurred to diminish the strength of these familial institutions, there is no reason why fertility should have declined" (p. 258). Nor did it. Hence, natural increase is very high—and has been for several decades.

The major conclusion appears to be that there will be a large increase in the mortality rate, "unless drastic changes are made in the social environment of family life" (p. 260). But there is no evidence that drastic changes will be consciously attempted.

It is not clear whether or not the findings set forth in this book apply to the Chinese generally. The author does state that "Facts have been presented so as to illustrate the general problem: What are the consequences of introducing 'backward' peoples to certain advantages of modern technology without its counterparts in social organizations?" But I am not sure that the experience of Taiwan is likely to be repeated elsewhere. The description of how the Japanese administered the Island without disturbing traditional lines of authority at the village level suggests that this may have been a very unusual experience. Certainly, the introduction of modern technology among other groups is more likely to create disturbances in the social organization than to leave it virtually undisturbed.

The book is quite readable, and typographical errors are few indeed. I wish that some of the basic tables had been presented —if necessary, in lieu of some of the charts. In particular, tables are needed to supplement the discussion of movement among occupations (pp. 84–98). For example, I could not verify the statement that older men—40 to 54 in 1930—entering agriculture "reveal a degree of movement at least as great as that of the persons who abandoned farming at younger ages." Several other statements in this section were of interest, but the charts are not in sufficient detail for me to extract the same conclusions as did the author, who, of course, had access to the tables that are needed to verify the statements. Also,

the life tables present only values of l_x, but q_x values would be desirable.

One other minor criticism might be mentioned. The author has a good discussion of the economically active population, and points out the principal defects of the available data. He did not, however, always make clear the sense in which he was using terms such as "work," "economic activity," and "not real inactivity," particularly when discussing the role of women among the employed.

The chapters pertaining to mortality and fertility are very interesting, although I found the discussion of household size and structure (Chapter VII) too detailed. On the other hand, the chapter on "Patterns of Marriage and Divorce" was most rewarding.

Barclay's other book is A REPORT ON TAIWAN'S POPULATION TO THE JOINT COMMISSION ON RURAL RECONSTRUCTION. It is understandable that there is a moderate amount of repetition in this report and in COLONIAL DEVELOPMENT AND POPULATION IN TAIWAN. Presumably administrative considerations dictated the necessity for issuing two documents; otherwise the materials presented could easily have been combined into a single publication. The principal contribution of this report is the presentation of some postwar data on the population of Taiwan. These figures are incomplete in that large numbers of persons on Taiwan were not included in the household registration system. "The scope of Taiwan's household registration has been deliberately restricted so as to exclude people in certain categories. And the people who are left out comprise a large segment of the population" (p. 10). Military personnel, including their households, and the "Floating Population" (p. 16) are not included in these statistics. The author discusses the deficiencies of postwar population data in Taiwan and makes estimates of underregistration of deaths, particularly among infants. Also, projections of the population of working age to 1980 are included, although the mortality and fertility assumptions are not made explicit (survival rates of 1936 to 1940 are used to 1965). Some data on the occupational distribution of economically active males in 1940 are given for the first time in the English language in this report.

A moderately intensive study of fertility of rural women was made from a sample of registration records. The limitations of this study are pointed out both in the report and in the appendix following the report proper. Some of the possible biases inherent in the survey procedure are disturbing, but not enough detail regarding the survey is given to enable the reader to evaluate fully the study. In spite of this defect, the findings of the study are interesting. The author again concludes that the present rate of natural increase cannot long continue because resources are limited and opportunities for emigration are virtually nil. Thus, unless drastic action is taken by government officials to reduce the fertility rate—a step that is not likely to be taken soon—the mortality rate will, of necessity, rise appreciably in the not so distant future.

W. PARKER MAULDIN*

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COMMUNITY CONDITIONS AND PSYCHOSES OF THE ELDERLY[1]

THIS report presented originally at the American Psychiatric Meeting in Los Angeles, California on May 5, 1953 shows the preliminary findings of the possible effects of social conditions upon persons with cerebral arteriosclerotic and senile psychoses. The investigation was conducted by a group in the research section of the New York State Mental Health Commission.

The group outlined several areas to be explored:

1. Do cerebral arteriosclerotic and senile psychoses hospital admission rates vary in different populations?
2. If so, what characteristics distinguish the populations with high rates from those with low rates?
3. Do such variations reflect disease incidence variations?
4. Are the characteristics of populations with high rates characteristic of patients, or only of their associates?
5. Do modifications in the related characteristics of high rate populations reduce the incidence of cases?
6. And/or of hospitalized cases?

Preliminary findings were obtained for the first two ques-

* Bureau of the Census.
[1] Gruenberg, Ernest M., M.D.: Community Conditions and Psychoses of the Elderly. *American Journal of Psychiatry*, June, 1954, 110, pp. 888–896.

tions, and from the data it was indicated that there was a high incidence of first admissions to a mental hospital among persons with cerebral arteriosclerotic and senile psychoses from the heart of the City. Furthermore, the percentages of multiple family dwellings and of persons living alone were relatively high in this area.

In order to determine the characteristics distinguishing the population with a high rate of first admission to a mental hospital from the other populations in the City, several criteria had to be considered. These included the selection of a city which was:

a. big enough,
b. not unrepresentative of American cities in its size range,
c. which has been census tracted by the United States Census Bureau with more or less socially homogeneous census tracts,
d. with a climate of opinion favorably disposed towards cooperation with forward-looking community research.

The city of Syracuse, New York was chosen for study. Cerebral arteriosclerotic first admissions to a mental hospital were allocated to the census tract. Admissions from nursing homes, hospitals, and other institutions were omitted. Computation of census tract rates and computation of "expected" admission rates from each tract were made. Selection of census tracts which had high rates, and the determination of the characteristics which separate the high rate tracts from the rest of the census tracts, were considered.

It was found that ten of the fifty-two census tracts in Syracuse had high first admission rates to a mental hospital, and that they were located in or near the heart of the City. Furthermore, the investigating team discovered that there were twenty-five census tracts of low socio-economic status including the ten high rate tracts. Because it was revealed that some of these tracts did not have high first admission rates to a mental hospital, a study was made using a composite socio-economic index, comprised of six items, to determine the difference, if any, between the high rate tracts from the other lower socio-economic tracts. The index consisted of the following items:

1. Mean contracted or estimated rental.

2. Percentage of homes with mechanical refrigeration.
3. Percentage of homes which were detached, single-family homes.
4. Percentage of persons in certain occupations.
5. Percentage in the labor force looking for work.
6. Median school year completed.

In addition, a direct inspection of the area was made. It was of particular interest to note the high number of multiple family dwellings within this concentrated area. From examination of the data and the area, it was felt that other sociological factors were more important in the hospitalization of psychoses rather than the socio-economic score. Whenever the density of dwelling units per structure increased, the first admission rates to a mental hospital were correspondingly higher, and likewise, the percentage of persons living alone also seemed to be higher in the first admission rates of persons with cerebral arteriosclerotic and senile psychoses. It was shown, however, that all other psychoses combined had this same relationship, although individual types had not been explored.

This analysis pointed up the need for further study to resolve:

1. Determination of whether a disproportionate number of hospital patients tend to have been living alone prior to hospitalization.
2. Determination of whether the cases come disproportionately from multiple family dwellings.
3. Determination of whether those first admissions who were not living alone at the time of admission were undergoing a process of social isolation without physical isolation.
4. Determination of whether isolation is an early symptom of psychosis formation, is causative of psychosis, or both.
5. If physical or social isolation is found to be causative, determination of methods by which such isolations may be prevented and by which it can be arrested and reversed once begun.

This report has shed light on the community conditions surrounding the aged person, and it is hoped that if the amelioration of some of these conditions will alleviate the inevitability of psychoses, progress toward better health will be realized soon for these individuals.

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